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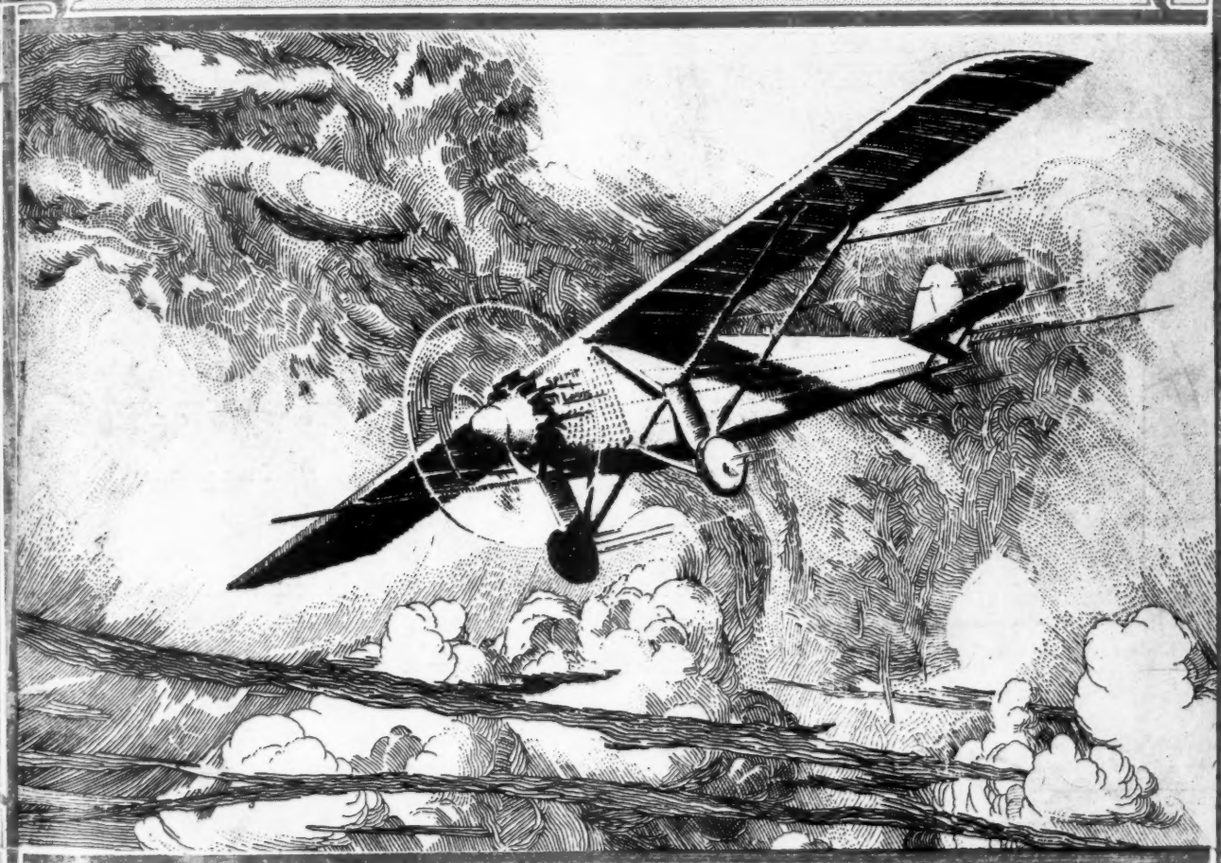

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VOLUME XXIV

NUMBER 21

Special Features

The Curtiss "Robin"
The Hallett Aircraft Engine
Etching of Aluminum Alloy Propellers

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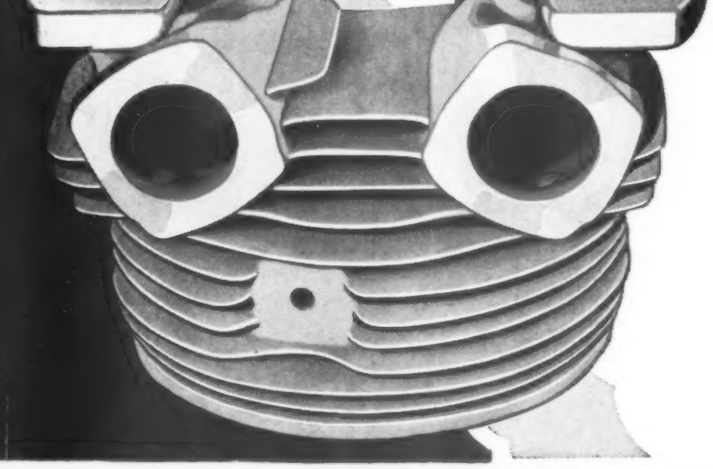

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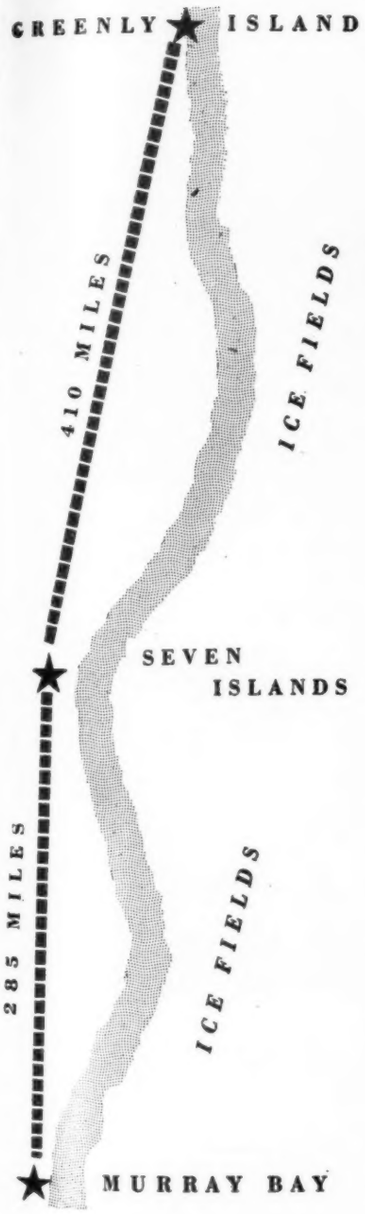

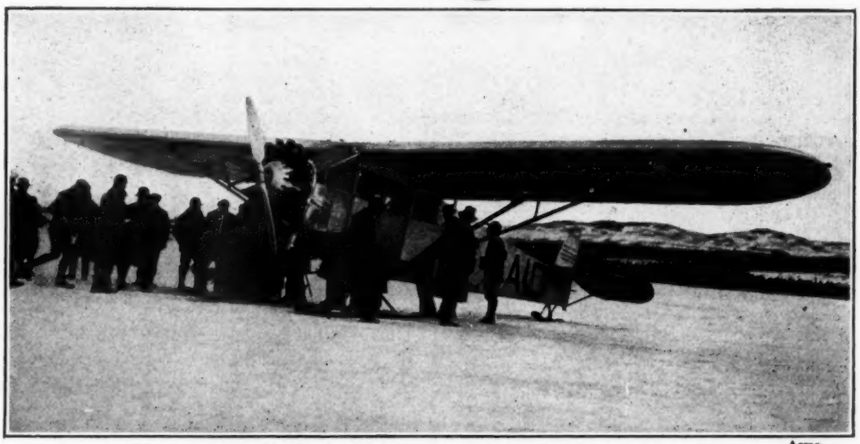

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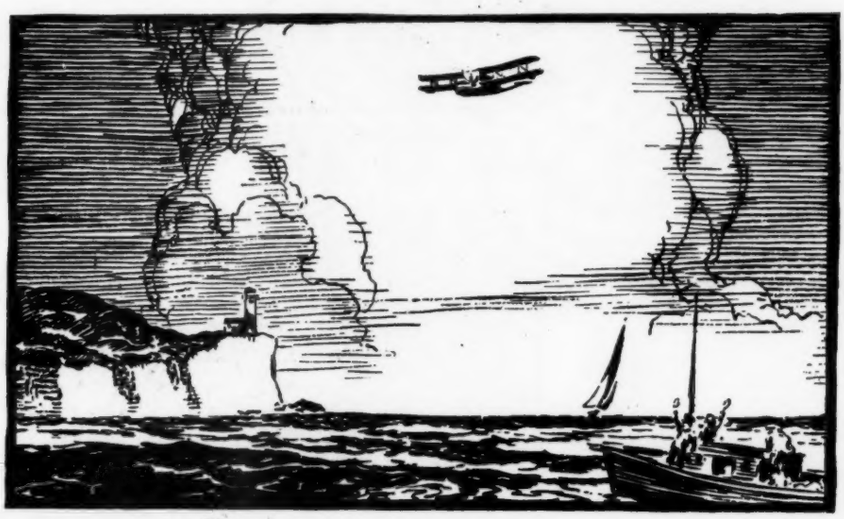

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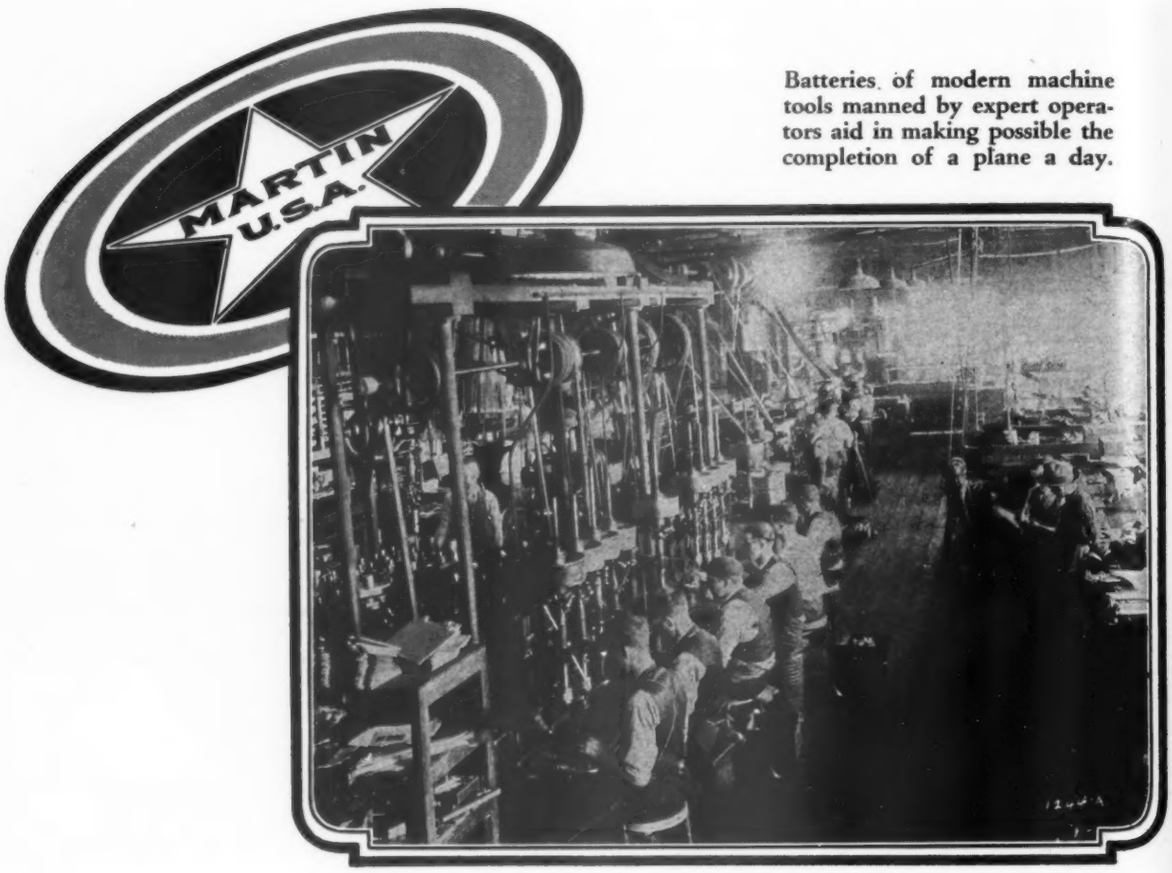

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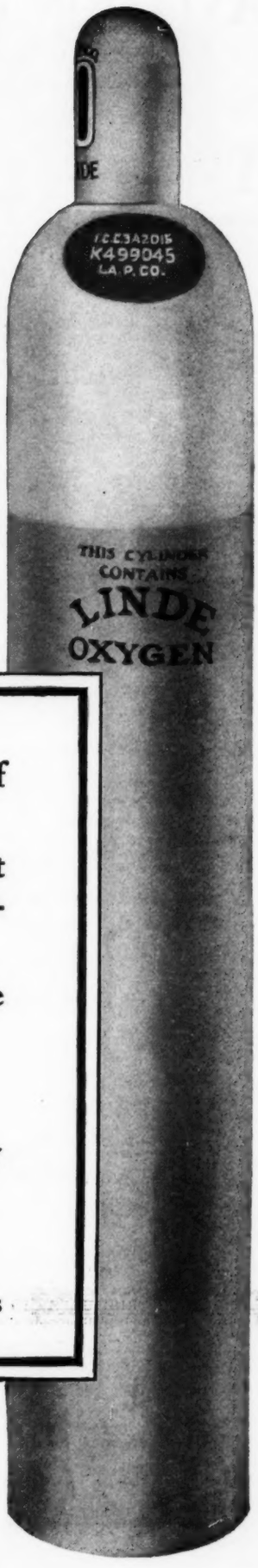

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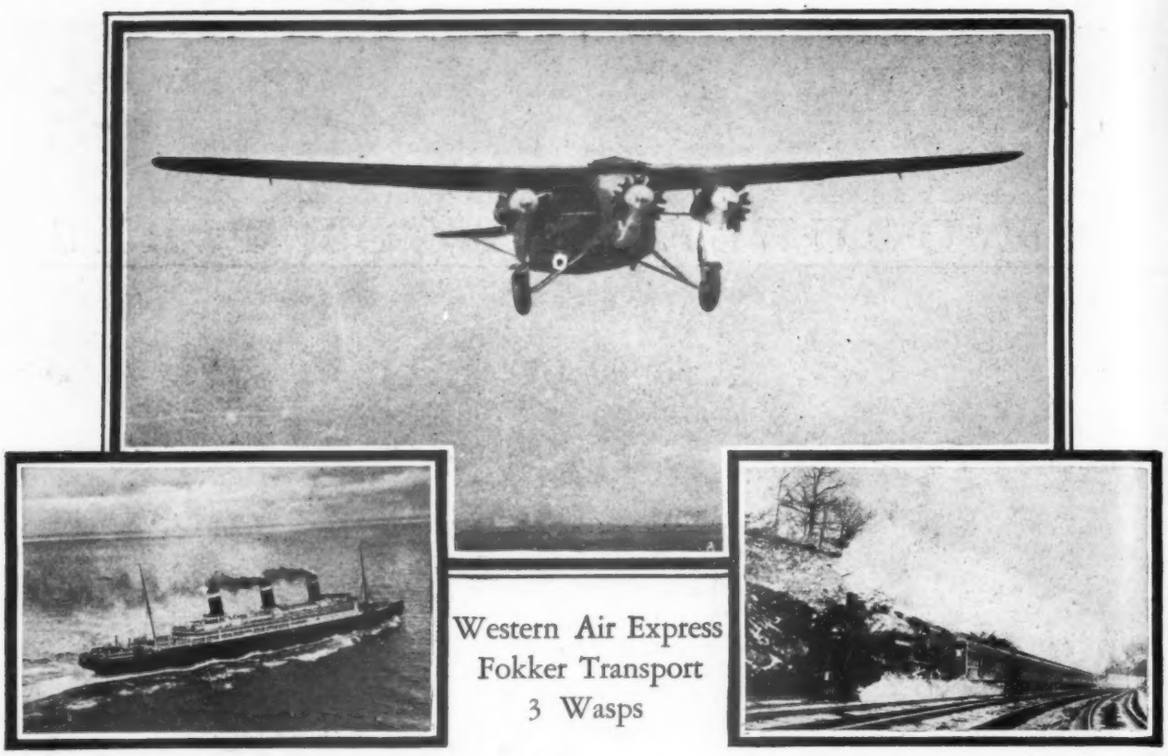

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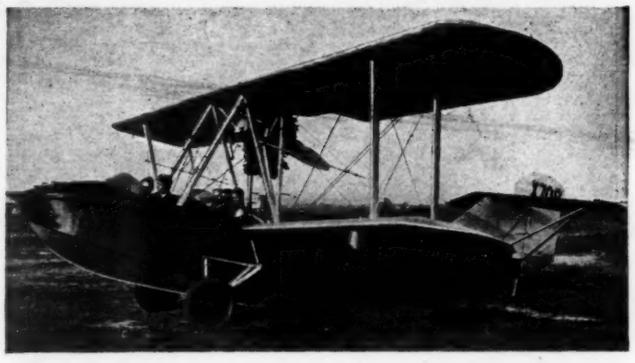

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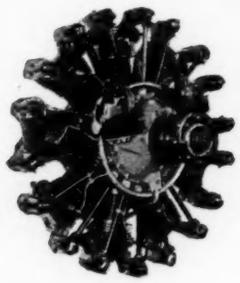

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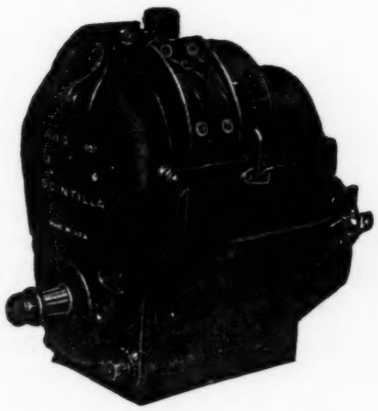

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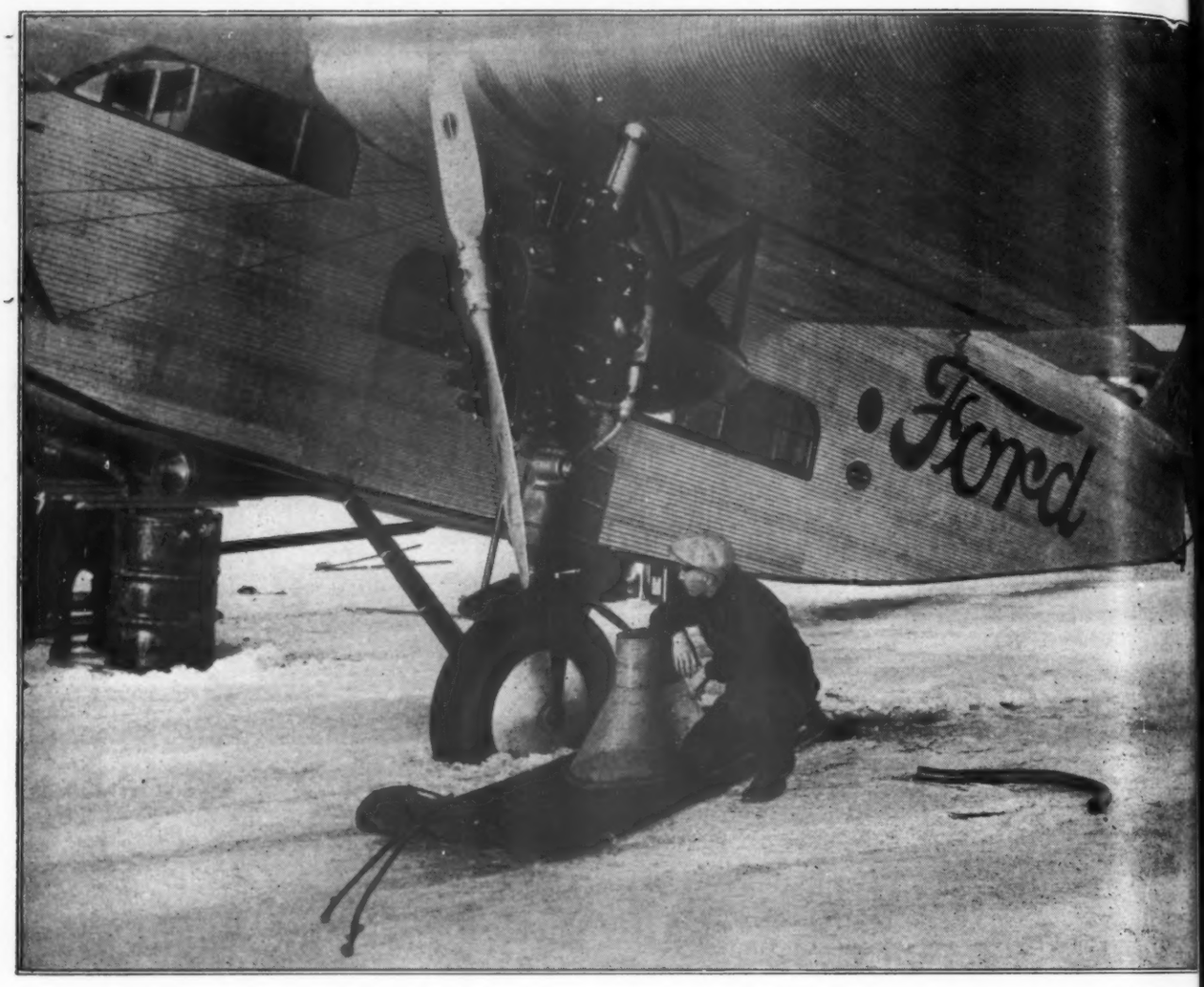

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AVIATION

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Vol. XXIV | *MAY* 21, 1928 | No. 21

Too Many Ideas

IN THE early period of development of almost any industry those who have the courage to do the pioneering work have a strong desire to develop their own ideas. This is in itself an excellent characteristic, especially if the ideas are sound, but also it can be carried too far. There must be a certain number of people who remain impartial and judge whether the ideas are sound or not and who do not block sound development by trying to impose ideas of their own which they wish to see developed.

In the commercial field the buyer is the ultimate judge and if a product or an idea is not basically correct it gradually fades out of the picture. In the military field the check is much more difficult. The tax payer who is the ultimate user is too far removed to have any except the most general control. Even the flier who is the actual user is several steps removed from the actual purchasing power and even he cannot reduce his experience to the easy standard of whether the equipment pays for itself. Between the flier and Congress, who makes the purchases, come several intermediaries all of whom have their ideas and as a result impartial testing is hard to get.

There is perhaps no field in which this is more true than that of instruments. Much of the work must be done in the laboratory but the testing must practically all be done in actual flight. In civilian work as well as in the military field it is exteremely hard to get an impartial test of instruments. Not only have the engineers in charge of the test work got their own ideas but every pilot has a pretty good notion of what an instrument should be. When a new instrument is brought out the maker has the greatest difficulty in getting an impartial and thorough study of its possibilities and defects. The difficulty lies to a considerable extent in the fact that those doing the testing have too many ideas of their own.

Cheap Cigars

FROM ALL appearances there seems to be quite a number of persons who are interested in aeronautics, and in some cases are actually making their living out of the industry, who do not make use of the air mail even for their most important letters. Undoubtedly the reason for this is the fact that they have been careless or lazy about obtaining air mail stamps and seeing to it that the stenographic force puts them on the proper letters.

This office has adopted a very simple (and effective) method of making sure that the air mail is used. Orders have gone forth that all dictated letters to points on an air mail route, or more than a night's train journey away shall go by air mail. If the stenographer forgets to use the air mail envelope the writer (by checking up when he signs the letter) has the right to collect one cigar from the stenographer. True, the quality of the cigar has not been stipulated, but there is a certain satisfaction in receiving a free cigar even if it is not a very good one.

The Connecting Link

ONE YEAR ago Col. Charles A. Lindbergh spanned the Atlantic and linked New York and Paris by a non-stop flight. The feat was marvelous enough in itself but its results have been even more extraordinary, because that flight, which in many ways had the aspects of a stunt, has proved to be the connecting link between commercial aviation and the public.

As a matter of fact real commercial aviation existed in this country before the epic events of last spring. However, the public did not realize it, and its possibilities lay dormant until Lindbergh's feat and his extraordinary personality brought aviation to its attention. Airplanes are little different today than they were a year ago, but the industry is a far different thing than it was when Lindbergh made his great flight.

The effects of that history making flight upon the growth of the aeronautical industry have been very nearly as spectacular as the flight itself. During the year that has passed since Lindbergh thundered down the Roosevelt Field runway the enthusiasm for things pertaining to aeronautics has spread like wildfire throughout the entire civilized world. Hundreds of landing fields have been constructed and plans and preparations have been completed for the establishment of thousands more in the very near future. Aeronautical enterprises which were absolutely unable to finance themselves before the great New York to Paris flight are now able to secure the necessary capital with little or no investigation of the merits of the proposition. Airplane and engine factories have sprung up like mushrooms all over the country and all are unable to fill the orders that have come piling in. Flying schools and taxi services that were once just barely getting by are now doing a great volume of business. In short, the aeronautical industry has at last come into its own, and the old timers who have sacrificed so much that aviation might live are celebrating the forging of the connecting link and the realization of their fondest dream.

The Curtiss "Robin"

New Commercial Cabin Monoplane Powered with an OX-5 has a High Speed of 99.7 M.P.H. and Lands at 40 M.P.H.

By ROBERT R. OSBORN

THE NEW Curtiss "Robin" has made its appearance, quite appropriately, in the springtime, and, like its namesake, promises to become more numerous in the fields as the summer wears on. It was unfortunate that flight tests on the new plane were not completed in time for it to be exhibited at the All-American Aircraft Show at Detroit, as, judging by the interest aroused by the announcement of the new plane and the literature describing it, the exhibit should have been a very popular one.

So far it has been flown extensively by "Casey" Jones and Paul Boyd, both of the Curtiss organization, M. M. Merrill, manager of the Curtiss Flying Service, Col. Charles A. Lindbergh, Maj. W. B. Robertson and several of the flying service pilots. The immediate reaction of most of those who have flown in it, or have even seen it, seems to be to ask Major Robertson, of the Curtiss-Robertson Airplane Manufacturing Co., for the agency in some particular district. Major Robertson says he has enough requests for the agency so far that it seems one could be placed in every county in the United States, but that no contracts have been signed, or will be signed, until the construction program is completely organized and the plane actually on a construction basis, so that definite promises of delivery can be made and kept. Everyone is well pleased with the plane, and its performance, appearance and unusual controllability and maneuverability, draw many compliments from all who have flown in it.

The Robin is a high wing monoplane with the airfoil section maintained across the top of the fuselage. The cabin is inset in this wing and as the top of the wing forms the top of the cabin, the depth of the section gives additional head-room. The lift truss is composed of two struts from the bottom of the cabin to a small auxiliary truss under the wing. These two main struts are each enclosed by ribs and a covering which form the same airfoil section as the main wing. These strut wings extend only to the auxiliary truss as they would interfere with the main wing beyond that point. The power plant is the 90 hp. Curtiss OX-5 engine. The Curtiss-Robertson Company is in the fortunate position of owning 1150 of these engines and a large store of spare parts. The plane has also been analyzed structurally to take

The Curtiss "Robin" in the air.

the new Curtiss "Challenger" air-cooled engine which develops 180 hp. The Robin seats a pilot and two passengers.

The ailerons are the usual unbalanced type, which have been found to give splendid lateral control. The rudder and stabilizer are not balanced but give full control at the stall, with very low stick loads over the flying range. The stabilizer is readily adjusted by a lever at the pilot's left side.

By utilizing the wing lift truss as part of the landing gear truss, a light wide tread landing gear is obtained. By

Front quarter view of the new Curtiss "Ro bin" three place cabin monoplane (OX-5)

this arrangement the small angles between struts, which are necessary in most landing gear arrangements, and which cause greater structural weight and aerodynamic interference, are eliminated. The steerable tail skid allows the pilot to handle the plane on the ground as well as any plane equipped with wheel brakes.

The plane was completely designed, and the first three or four are being built by The Curtiss Aeroplane and Motor Co., Inc., at Garden City, Long Island, N. Y. Production on

Colonel Lindbergh and Major Robertson in front of the new Curtiss "Robin".

a large scale will be taken to the newly constructed factory of the Curtiss-Robertson Airplane Manufacturing Co., at Anglum, near St. Louis, Mo. This factory, which is now completed, has been built new for the production of this airplane only, and therefore production should be smooth and the planes turned out in satisfactory quantities.

Models of the airplane were tested in the Curtiss seven-foot wind tunnel for aerodynamic qualities. The high performance of the plane is directly traceable to these tests as numerous wing and cabin arrangements were tested and the best one selected. Adequate control in any attitude of the plane was also insured by these tests.

Structural analysis was complete and the structure at every point has an additional margin of safety over the requirements of the Department of Commerce. The long experience of the Curtiss engineers in watching their designs in service conditions enabled them to make additional allowance for parts of the structure which are likely to get hard service, or for materials which tend to deteriorate with age and weathering. All materials are tested by sample, and numerous drop tests were made on the landing gear and tail skid, and complete load tests were made on control surfaces, ribs, beams and numerous fittings. The assurance is rather well established that it is an aerodynamically and structurally safe airplane.

Following is a summary of the performance tests of the Curtiss flight test section. These trials took two weeks to complete and were run in exactly the same manner that a new plane for the Army or Navy is tested. All data is reduced to standard atmosphere.

Flight Test Summary

Robin Cabin Monoplane. OX-5 Engine

(All data below is for the full load condition)

Gross weight	2173 lb.
Landing speed	40.0 m.p.h.
High speed (sea level)	99.7 m.p.h.
5,000 ft.	97.3 m.p.h.
10,000 ft.	91.8 m.p.h.
Service ceiling	12,750 ft.
Absolute ceiling	16,650 ft.
Take-off time, full load	7 to 9 sec.
Climb to 5,000 ft.	14.6 min.
10,000 ft.	36.4 min.
Service ceiling	57.0 min.
Climb in 10 min.	3,700 ft.

	With 30 gal. gasoline	With 50 gal. gasoline
Endurance, full throttle	3.7 hr.	6.1 hr.
Range, full throttle	370 mi.	608 mi.
Endurance at 80% max. r.p.m.	6.2 hr.	10.7 hr.
Range at 80% max. r.p.m.	490 mi.	850 mi.

General Characteristics—

Wing loading	8.2 lb./sq. ft.
Airfoil section	Curtiss-72
Load factor, high incidence	6.5 Dept. of Commerce requirement
C.G. in per cent. of mean aerodynamic chord	33.5
Fuel consumption, full throttle	49.0 lb./hr.
Oil consumption, full throttle	3.0 lb./hr.
Fuel consumption at 80% max. r.p.m.	29.1 lb./hr.
Oil consumption at 80% max. r.p.m.	2.0 lb./hr.
Fuel capacity	50 U. S. gal. total, 30 gal. normal load
Oil capacity	4 U. S. gal.

Dimensions—

Length, overall	25 ft., 8½ in.
Height, overall	7 ft., 4 in.
Span, overall	41 ft., 0 in.
Chord	72 in., main wing 15 in., each lift strut
Incidence	0 deg.
Dihedral	1½ deg.
Sweepback	0 deg.

Areas—

Wing, including ailerons	265 sq. ft.
Ailerons, total	22 sq. ft.
Horizontal tail area, total	36.3 sq. ft.

Typical one-piece stamped "Robin" rib being tested in engineering laboratory. Weight of rib .59 of a pound. Load taken, 535 lb. without yielding.

Vertical tail area, total	15.2 sq. ft.
Elevators, total	14.8 sq. ft.
Rudder	9.8 sq. ft.

Among the unusual structural features of the new plane, an outstanding one is that the wing ribs are made entirely of the new Alclad metal (duralumin with a pure aluminum coating) and are pressed into shape from a single sheet. These ribs weigh .50 lb. each and take a properly distributed load along the chord of 535 lb., without yielding. These ribs are placed on spruce spars having the normal type of drag brac-

Continued on page 1482

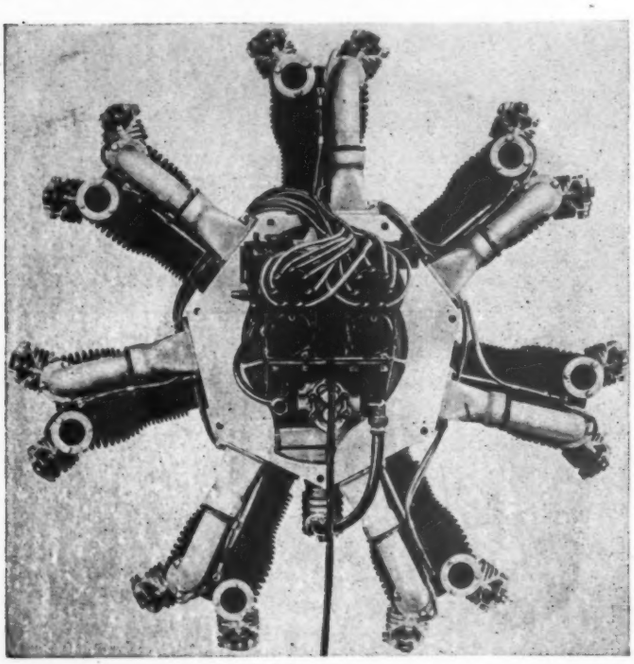
The Hallett Aircraft Engine

By CHARLES F. McREYNOLDS

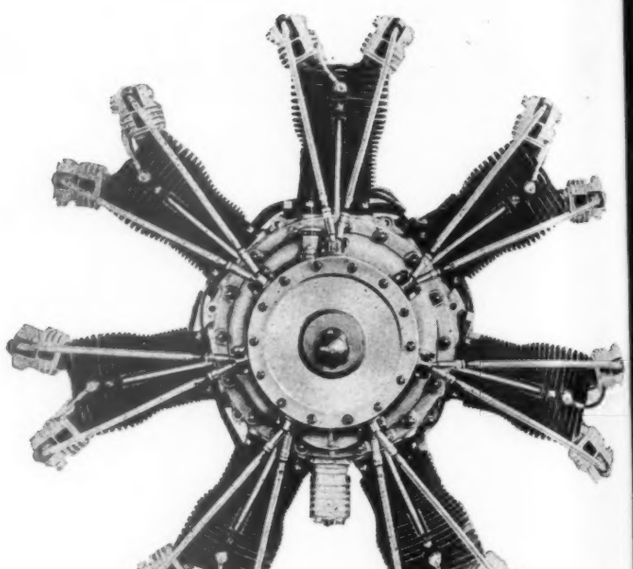
WITH THE first unit of 50 engines contracted for and now in production for delivery within 60 days, the Hallett Manufacturing Co., Los Angeles, Calif., is definitely in the market with a new radial aircraft engine. The Hallett model H-526 is a seven cylinder, static radial, air cooled engine rated at 130 hp. when turning a maximum of 1800 r.p.m. The cruising speed is 1500 r.p.m., displacement is 526 cu. in., total weight 425 lb., bore 4⅜ in. and stroke 5 in.

After years of study and experiment the seven cylinder 130 hp. model was developed because of its inherent smoothness and the fact that a 130 hp. engine will probably be the logical equipment for many of the commercial airplanes now being built.

Apparently conventional in design and construction, the Hallett engine is most noteworthy for the exhaustive engineering work which has been done with a view to making it an ideal commercial engine so adapted to automotive production methods that it may be built and sold at an exceptionally low price. So carefully has the air cooling of this engine been worked out that the highest temperature reached during the test run was 350 deg. just below the exhaust port. The maximum variation of temperature in the cylinder head is said to be under 30 deg., which is exceptionally low for an air cooled engine.



Rear view of the Hallett H-526 engine showing the Splitdorf magnetos and the Zenith carbureters.



Front view of the 130 hp. Hallett engine.

Accessibility of an ideal sort is also provided. To dismount the engine it is only necessary to loosen one flexible tube connection and the mounting bolts to remove it from the engine bearer. The engine may be disassembled from the front of the airplane without removing it from the fuselage mounting; the only tools necessary once the propeller hub is off being a ⅜ in. and a 7/16 in. open end wrench. The engine may be completely disassembled without pulling a gear. All accessories are mounted in the open and may be reached without dismounting any part of the engine.

Realizing that in commercial work a product must stand serious abuse, Mr. Hallett has built the engine very sturdily, and it is expected to prove of exceptional reliability and durability. No appreciable wear has been shown after testing this engine for hundreds of hours on the test stand. The comparatively high weight power ratio due to this substantial construction is offset by the low fuel and oil consumption. The Hallett engine operates at full load on less than seven gallons of gasoline and half pint of oil per hour.

Low Maintenance Costs Possible

Simplified design and machine production have made possible not only the unusually low first cost, but assurance of low maintenance costs. Interchangeable parts and accessibility will lower stock room overhead and total man hours on overhaul jobs, it is believed.

Two Zenith carbureters are mounted at the rear of the crankcase and dual ignition is provided with B.G. Hornet plugs. The lubrication is force feed with a scavenging system which includes air cooled oil sump and scavenging pump. Dual ignition is provided using two Splitdorf magnetos.

Each of the cylinders is cast in one piece with integral fins. The cylinders are of special composition gray iron automatically machined with boring, facing and turning being performed in one operation. Four long and two short Mac-Whyte tie rods hold the head and cylinder to the crankcase.

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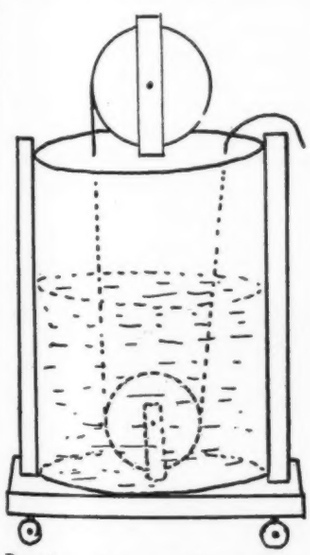
Speeding Up Production *in the* Factory

By WILLIS PARKER

OWING TO the newness of the industry, aircraft manufacturers have had to devise many appliances, peculiar to their needs, in order to speed up production. Three interesting devices have been constructed by the Alexander Aircraft Co. to be used in connection with glueing. One device facilitates the glueing of the long boards from which the wing spars are made; another speeds up the glueing of small bits of wood used in the construction of the wing ribs and the third cuts down by half, the time it takes to glue the lengths of tape placed over the seams and where rows of tacks fasten the cloth covering to the wing frames.

Because of the length of the wing spars—up to 25 ft.—no glue presses were available. Many manufacturers have been and still are using "C" clamps to hold the boards together while the glue dries. D. M. Alexander, chief of the engineering department of the Alexander Company devised a very simple press, in which 24 in. boards, or 12 pair, may be pressed at one time.

A row of stantions were built with a pressure plate at the bottom coupled with a pressure plate at the top, against which screw jacks, spaced 15 in. apart, the full length of the frame—25 ft.—press under a potential pressure of two tons each.



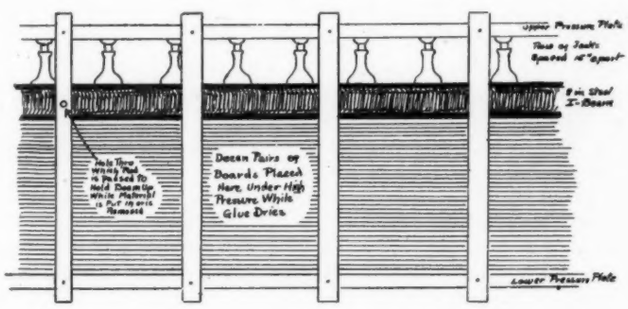
Drawing of a portable tank to be used in taping wing ribs.

When 12 pairs of boards have been glued, they are placed in the stantion, and a long, ⅛ in. steel I-beam is placed on top of them. The jack screws rest on top of the beam with their heads against the upper pressure plate which, as previously mentioned, is coupled to the bottom pressure plate by steel rods. The pressure is applied by turning the screws with a small bar.

Since the steel I-beam is the same width of the boards—eight inches—the pressure on the boards is equal over the entire surface. The jacks spaced 15 in. apart insure equal pressure the full length of the spars.

To facilitate removing of the boards when they have thoroughly dried, arrangements have been made to loosen the jacks, lift the steel beam two inches, insert a bar in holes in the stantion frame and this holds the bar and the jacks up until the next load of spars is ready for pressure. By this method twelve spars may be laminated at one time in 24 hr. The time required to clamp them down has been reduced at least 75 per cent. over the old system of clamping each pair of boards with a series of C-clamps.

In the construction of the wing ribs, numerous thin pieces of lumber must be glued into narrow grooves in other strips of wood. To apply the glue with a brush would take considerable time. So a device that might be likened to a pastry bag was constructed from an oil can and a piece of automobile inner tube. The bottom of the oil can was removed and the inner tube fitted over the can, with a clamp. The spout of the can unscrews, leaving an opening large enough to pour in a quantity of glue. Then the top or spout is replaced, and, by applying a little pressure to the inner tube, the liquid glue is forced out of the spout in a small stream which may be directed along the groove in the wood by the worker. The bottom end of the tube was sealed, of course.


Upper Pressure Plate
Bolts
Steel I-Beam
Dozen Pairs of Boards Placed Here Under High Pressure While Glue Dries
Lower Pressure Plate

A drawing of a section of the 35 ft. glue press developed by the Alexander Company.

One girl, equipped with this little arrangement, can apply the glue to a series of grooves just as quickly as she can slide the tip of the oil can from one side of the frame to the other.

Over in the wing and paint department is another clever scheme used in connection with placing the strips of tape over the wing fabric to protect the stitching. The tape is usually moistened in the dope that is used on the wing fabric to tighten the cloth and usually is applied after the first coat of dope—lacquer—has been applied to the cloth. The usual method of applying the tape, is to cut off a piece the required length, dip it in a bucket of dope and then slap it over the seams. This takes too long for the Alexander people, so they devised a five gallon tank on a roller platform. On top of the tank is a spool for the roll of tape, which is unwound from the spool as needed, goes in a continuous strip down to the bottom of the tank, around a spool at the bottom and up to the top again and through a slit in the cover. The tank is filled with dope. Obviously the tape, passing from the upper spool, into the tank, around the lower spool and up to the top again is thoroughly saturated with the lacquer. Two men work the appliance. One is on the opposite side of the wing and takes the end of the wet tape from his associate and lays it flush with the seam on his side. His associate snips off the length with a pair of scissors and they smooth it down in its proper place. Since the tank is on rollers, it can be wheeled to any portion of the room desired and can be moved along the length of the wing as taping proceeds.

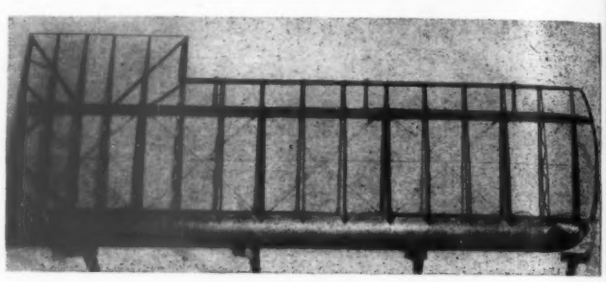
The Stearman Biplane

Models C-2B and C-2K were Designed for All-Around Service and Differ Only in Engine Installation

THE STEARMAN Aircraft Co., recently of Venice, Calif., and now located at Wichita, Kan., is in production on a light commercial or private owner airplane. The plane was carefully designed and engineered before construction, rather than after production had been started and as a result, few changes have been necessary. This fact is well exemplified by the service that Stearman mail planes are giving to the air mail operators of the west and northwest.

In the conception of the design, an effort was made to produce a somewhat versatile airplane. The result is that one basic design has been created that will meet the needs of the private owner, the flying school, the commercial operator, or the air mail contractor. Consequently, the type deduced was adapted to various power plants. The range which was selected for the power plant installation was from 90 to 250 hp. This permitted an increase in power of substantially three fold without altering the structure aft of the fire wall. In order that the craft could be adaptable to production with these various power plants, it was deemed advisable not to design to a particular engine but to the contemplated maximum power. The load factors which were to accompany this condition appeared to impose somewhat of a handicap on the structure and performance when engines of lesser power than the maximum were used. However, as a result of an investigation of the problem of variation in weight and performance with increase in load factor, the engineering department of the company found that the rate of change of weight with load factor would be approximately one per cent. That is to say, the structure would increase in weight one per cent. per unit increase in load factor. The change in performance of the lower powered models due to the increase in load factor was not appreciable. It was therefore deemed entirely justifiable to design for the maximum power. A high incidence load factor value of 8.5 was chosen, with the other attitudes proportional to this figure.

The structural advantages of a small lower wing and the aerodynamic superiority of a highly staggered, high aspect ratio wing arrangement is manifest in this design. The upper wing is constructed of two panels and a center section, while the lower wing is constructed of two panels, one on each side of the fuselage. Spruce is the dominant material used in the construction of the wings. The beams are of routed I section, while the ribs are of truss construction. The leading edge is covered with duralumin sheet for the entire span. The major portion of the wing fittings are fabricated from heat treated duralumin sheets and are treated with alumanized varnish. Production of these parts has been planned so that three different shaped fittings and wire lugs serve for all the attachment points. Internal drag brace wiring is entirely of tie rods, while the external wing bracing is of streamline tie rods and streamline tubes. Each of the outer panels



An upper wing panel. Note the dural leading edge and the aileron support brackets.

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Front quarter view of the Stearman biplane, model C-2K (125 hp. Ryan-Siemens engine).

Fuselage Analysis

Stress Analysis of Commercial Aircraft, Chapter Number Eleven

By PROFESSOR ALEXANDER KLEMIN
Daniel Guggenheim School of Aeronautics

And GEORGE F. TITTERTON
Late of the Bureau of Aeronautics, Navy Department

THE FUSELAGES of American commercial planes are almost all welded steel tubular structures. The steel may be either mild carbon (1025) or chrome-molybdenum steel. There are a few planes with dural fuselages, and some fuselages are still constructed of wood and wire. Fuselages of dural are probably somewhat ahead of normal development, but will become more common as the question of connections becomes better understood. The fuselage of our plane will be of welded chrome-molybdenum steel, except for the engine mount which will be of mild carbon. Using mild carbon for the engine mount gives tubes which are greater in diameter and somewhat easier to weld than the chrome-molybdenum tubes, and are more suitable for use where engine vibration is involved.

In the design of the fuselage it is of course necessary to place panel points of the truss at the wing and chassis attachment points, and to have a sufficiently deep tail post to brace the tail surfaces. In addition the tail skid location must be well braced. Structural members likely to impede the vision of the pilot should be as few and as small in diameter as it is also desirable to have the cabin entirely free of bracing members.

The tubular members employed in the fuselage truss are of course, designed as columns—either long or short depending upon the material, length, and diameter required. The coefficient of fixity, C, to be used in the design of these members depends upon the method of fastening employed. For welded jobs a coefficient of C = 3 is allowable; for well gussetted riveted joints C = 1½ is safe; and for pin-ended struts C = 1 must be used.

Requirements of the Commerce Department

In Chapter 3 of the requirements for the fuselage analysis were explained generally. They will be reviewed here in de-

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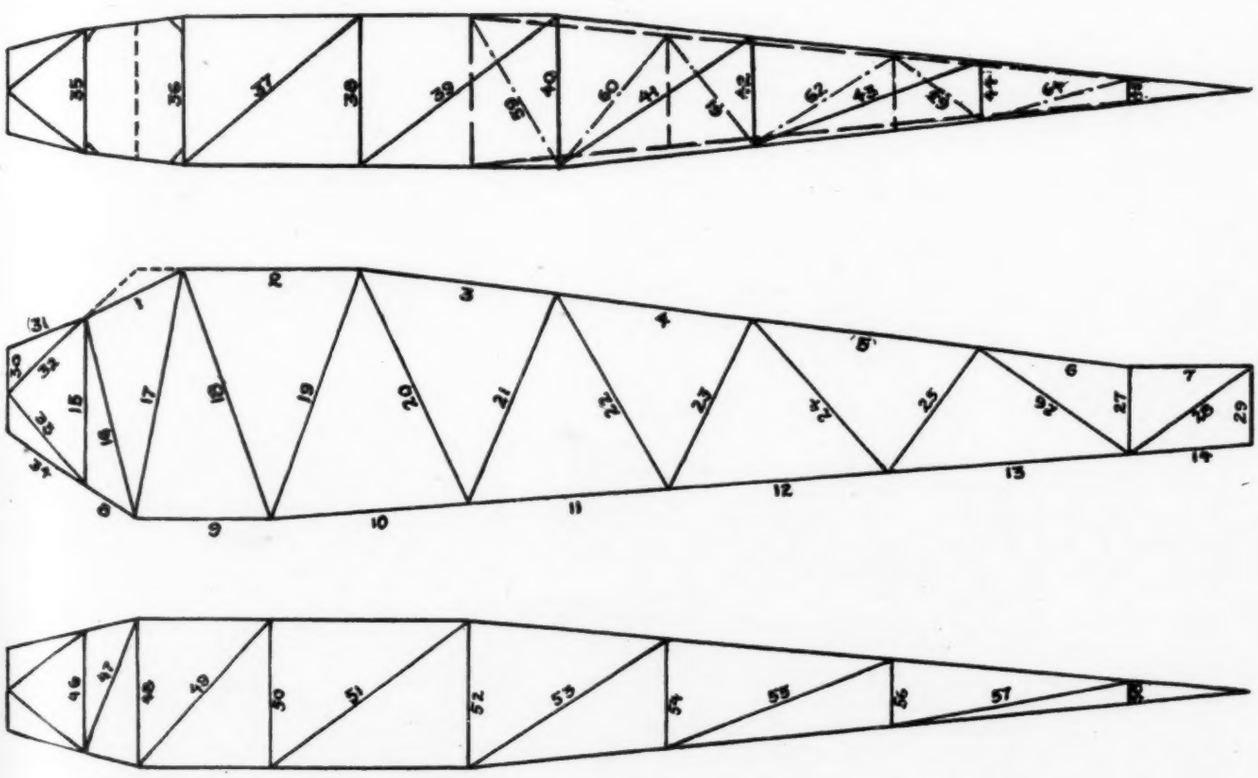


----- Pilots Window Frame. Non-Structural; — — — Bottom Truss in Plan View, —.— —.Diagonals from Side to Side

LINE DIAGRAM OF FUSELAGE, Fig. 71

Etching *of* Aluminum Alloy Propellers

BY A. J. LYON
1st Lieut., A. C.

ALUMINUM ALLOY propellers are subjected to a light etch, both in the process of manufacture and periodically when in use, for the purpose of detecting cracks or other defects that may be the cause of failures. The light etch, which should be distinguished from the deep etch used to reveal the structural features of the material, is accomplished by subjecting the surface of the metal to the action of a caustic soda solution for a short period of time, rinsing in water, and then removing the deposit of copper which forms during the etching operation with a water solution of nitric acid, and finally washing and drying. This is followed by a careful inspection and all apparent defects are marked. The small areas thus marked are then deep-etched locally for the purpose of definitely identifying the apparent defects.

Vats or containers for the caustic solution should be constructed of steel or wood and the size determined by the type and number of propellers etched. The manufacturers of detachable-blade propellers have found that cylindrical tanks installed in a vertical position, made of either steel or wood, are satisfactory. A rope or chain hoist and an overhead trolley are convenient for handling the propellers. At the Air Corps stations where all types of propellers must be etched, it is found that tanks approximately 12 ft. in length, 18 to 24 ft. high, and 12 to 24 in. wide, installed in a horizontal position, are satisfactory. Provision for heating by means of either steam or gas should be made on all permanent installations. The acid tank should be similar to the caustic tank in design and construction, but steel cannot be used for this purpose. Wood or welded aluminum sheet have proved to be satisfactory. Likewise, the tanks or vats for the rinsing water should be practically the same size as the acid and caustic tanks. It is preferable to have two, — one equipped to heat the water for the purpose of preheating the propellers and for the final washing, and the other for use in rinsing the excess caustic and acid from the surface of the etched propellers.

A 10 to 20 per cent. water solution of commercial caustic soda is used. In mixing simply add one to two pounds of caustic soda to each gallon of water, care being observed not to inhale the fumes or to allow the solution to splash on the clothes or hands. The concentration can be checked by measuring the specific gravity with a hydrometer or Baumé scale for liquids heavier than water. The specific gravities and Baumé readings corresponding to 10 and 20 per cent. solutions are 1.112 and 1.230, and 14.5 and 27.0, respectively. The caustic solution may be used for a long period of time, but unless fresh caustic is added the strength and concentration will gradually decrease. The specific gravity is not an indication of the concentration of the caustic solution after it has been used for etching aluminum alloys due to the presence of sodium aluminate. The concentration may be checked, however, by titrating in an alcoholic solution as follows: Mix exactly one ounce of the caustic solution with exactly two ounces of denatured ethyl alcohol and add 5 to 10 drops of an ethyl alcohol solution of phenolphthalein, which colors the alcohol-caustic solution pink. To this add an 8 per cent. water solution of chemically-pure concentrated nitric acid (2 parts nitric acid to 23 parts water), one ounce at a time, until the color changes from pink to a milky white. The addition of one ounce of the acid solution is approximately the equivalent to a 5 per cent. caustic solution; two ounces to a 10 per cent. solution; three ounces to a 15 per cent. solution; and four ounces to a 20 per cent. solution.

A 5 per cent. solution of nitric acid can be prepared by mixing one part of commercial nitric acid to 19 parts of water. The specific gravity and Baumé reading are 1.027

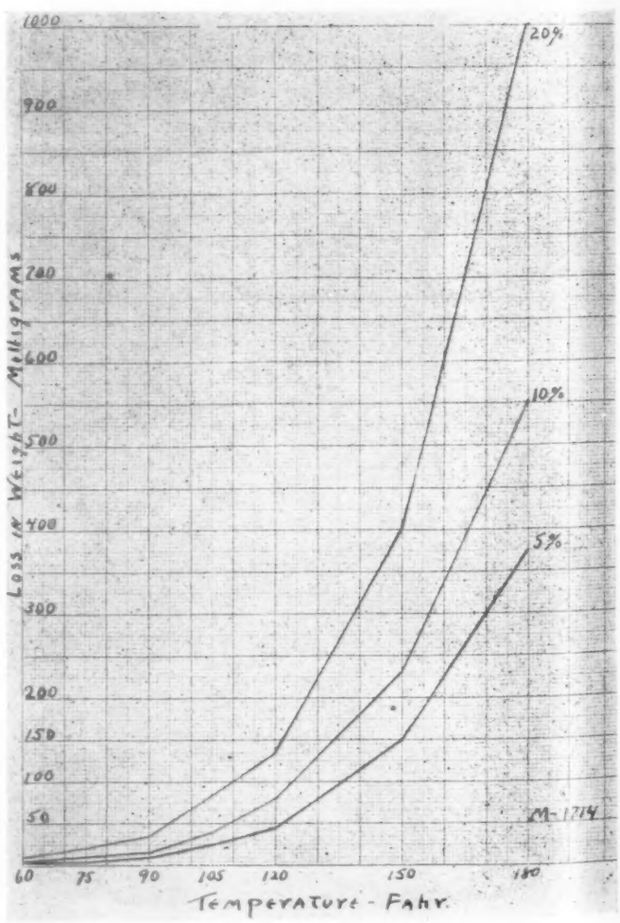


Fig. 1.—Graph showing the effect of temperature of caustic solution on the depth of etch of samples of an aluminum alloy propeller. Time of immersion, five minutes.

and 4.00, respectively. Care should be observed in pouring the acid into the water.

The methods of etching outlined herein have been used with good results and should be used as a guide. The details of the operations may be varied to meet the methods of manufacture or operating conditions and equally as good results obtained.

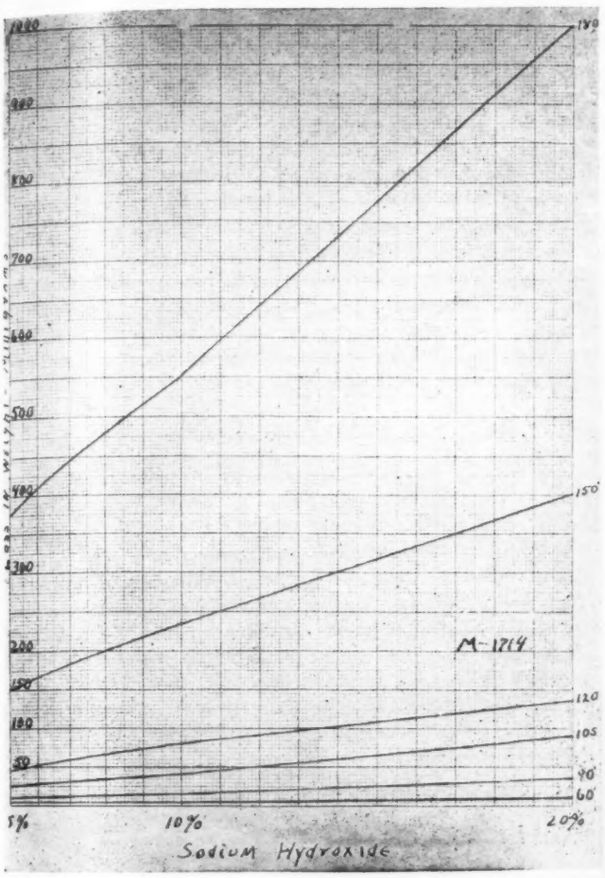


Fig. 2.—Graph showing the effect of the concentration of the caustic solution at various temperatures on the depth of etch of samples of an aluminum alloy propeller. Time of immersion, five minutes.

When propellers have been rag or color-buffed in the process of manufacture an amorphous film is formed over the surface of the metal which covers defects and is more resistant to the dissolving action of the caustic soda than a surface which has been polished with a fine abrasive. The amorphous film when formed must be removed in the etching bath in order that a proper inspection can be made. Therefore, the color buff should not be used as a final finishing operation. A good surface for etching and inspection and one that presents a good appearance is produced by simply polishing with a relatively fine abrasive, such as 180-grit emery and grease. The grease from the polishing operations must be removed by means of suitable solvents, and the same applies to paint, varnish, or other protective coatings on propellers that are in use. The hubs must be removed from detachable-blade types and Curtiss "D" type or twisted propellers. The Curtiss-Reed "R" or forged-type propeller may be etched with the hub or steel liner in place provided it is properly protected from the caustic solution as described hereinafter.

The temperature of the propeller should be approximately the same as that of the caustic solution. This is necessary in order to insure a uniform etch on all parts of the propeller. Should the initial temperature be below that of the caustic solution, the thin sections near the tip and edges of the propeller blades will etch much more rapidly than the heavy sections at the center of the blade and around the hub due to the fact that the latter sections require a considerable time interval to reach the temperature of the caustic solution due to the mass of metal involved. The propellers can be preheated by immersing in hot water and allowing them to remain for a sufficient length of time for all parts to reach a temperature slightly above or equivalent to that of the caustic solution. Water near the boiling temperature can be used to advantage for this operation. Before etching, the bearing surfaces in the hub section of the detachable-blade propellers and the steel hub of the Curtiss-Reed "R" type propeller should be covered with a grease having a relatively high melting point. The grease may be warmed and then applied with a two or three-inch paint brush or swab.

The propellers are then immersed in the caustic solution. The depth of etch is most conveniently regulated by the length of time the caustic solution is allowed to remain in contact with the metal surfaces. Methods of determining the proper length of time required for a satisfactory etch are to judge the color of the copper deposit, to measure the difference in thickness before and after etching, and to observe the etched structure. Propellers in the process of manufacture should remain in contact with the caustic solution until a decrease in thickness ranging from 0.0005 to 0.001 in. has been obtained. The time required can be determined very accurately, if the temperature and concentration of the caustic solution are held constant, by using small samples of a propeller alloy of known area and weighing before and after

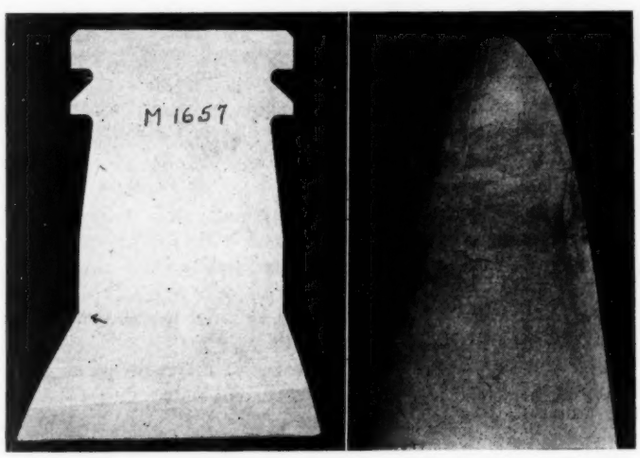


Fig. 3. (left)—Photograph of etched cross-section of the hub section of a detachable-blade propeller. Arrow points to crack formed during service of the propeller. Fig. 4.—Photograph of the tip of an aluminum alloy propeller, deep-etched. Arrows point to laps formed during forging.

etching, or by measuring with micrometers, care being observed to make all measurements at the same temperature. Propellers that are in service and have been previously subjected to an etch require a very short etching period and the amount of metal removed should not be measureable.

With a 15 per cent. solution at 90 deg. F. the desired depth of etch has been obtained by immersing the propellers for periods of time ranging from two to six minutes. Where the surface was polished and color-buffed they require five minutes, and where the surface was simply polished, two and one half minutes, to produce the desired depth of etch. With a 10 per cent. solution at 170 deg. F., polished propellers were

Continued on page 1475

Department of Commerce Makes Changes In Aircraft Engine Approval Requirements

ANNOUNCEMENT HAS been made of changes in approval requirements for aircraft engines by the Department of Commerce. This does not apply to engines already approved, which include: all engines approved and in use by the Army and Navy air services, the Anzani series, the Siemens-Halske series (Ryan-Siemens), the Fairchild-Caminez, the Warner Scarab, and the Kinner K5.

The requirements of the Department of Commerce for airplane engine tests are as follows:

1. Engines which have passed the regular endurance tests of the United States Army Air Corps or the United States Navy will be approved by the Department of Commerce. Other engines submitted for approval will be tested by the manufacturer, a private agency or by the Department of Commerce at the Bureau of Standards. Before permission is granted to a manufacturer or a private agency to test an airplane engine, the testing equipment must be approved by the Department of Commerce. Trained observers from the Department of Commerce will assist in and witness the tests made by the manufacturers or private agencies.

2. Test data—The log shall include the following: Piston displacement, compression ratio, type of ignition, carbureter and spark plugs; barometric reading and complete list of instruments and apparatus used for the test. The length of brake arm and gear ratio if propeller is geared shall also be given. The test shall be such as to develop the following data:

The Test Data

a. A plot of the power developed at various speeds with the throttle wide open.
b. Log of 50 hr. endurance test showing readings, at approximately 30-min. intervals, of:
   (1) Revolutions per minute
   (2) Brake load, in pounds
   (3) Oil pressure and temperature
   (4) Water temperature
   (5) Air temperature at carbureter intake
   (6) Blast velocity
   (7) Maximum cylinder-head and cylinder-barrel temperatures.
   (8) Manifold depression, in inches of mercury
   (9) Fuel time, in seconds, for at least 5 lb.
   (10) Oil, in pounds
   (11) Brake, horsepower
   (12) Remarks, including breakages and replacements (Item 4 does not apply to air cooled engines and items 6 and 7 are not applicable to water cooled engines.)
c. Photographs showing set-up used and any parts which failed or showed excessive wear.
d. Lists of instruments and apparatus used.
e. Report of final tear-down inspection.

Must be Designed for Starter

3. Preliminary requirements—Engines should be designed so that some type of starter can be fitted. If a starter is regularly supplied with the engine, such equipment either shall be used with all starts during the 50 hr. test or shall be tested for reliability. Dual ignition systems with at least two spark plugs per cylinder, will be required on all engines.

Before it is tested, the engine shall have been run by the manufacturer for at least 25 hr., and a log of this run shall be submitted to the Department of Commerce. The only requirement for this preliminary test is that the horsepower developed shall not average less than one-half rated power.

The manufacturer may be called upon for an explanation if his engine shows an excessive manifold depression at full throttle.

4. Block tests—The 50 hr. endurance test shall be run in ten 5 hr. periods. During the first five hours the engine shall be run with throttle wide open, the speed being at least equal to the rated speed and the power at least 10 per cent. in excess of the rated power. During the remaining 45 hr. the engine shall be run at approximately rated speed, and the horsepower developed should at no time be less than rated horsepower.

During the test not more than three forced stops shall be allowed. A penalty run of two hours will be added to any period in which a forced stop is made. If the speed during a propeller load run drops to less than 97 per cent. of rated speed or the power in a dynamometer run drops as much as 10 per cent., this shall require a forced stop. Excessive water, fuel or oil leaks developing at the engine shall require forced stops. In all cases the Bureau of Standards shall be the judge of what constitutes a forced stop.

May Make Minor Repairs

Minor repairs and replacements may be made between test periods if suitable tools and parts are available, but the test schedule shall not be delayed on this account. The failure of a major part of the engine shall terminate the test.

If the engine is submitted for test without qualifications as to fuel, any available gasoline meeting the federal specification for United States motor gasoline may be used. If the manufacturer does not consider that his engine can safely be run on all grades of motor gasoline, the engine shall be tested on the grade of fuel which he specifies and will be certified only for use on fuels of this grade or better.

On completion of the 50 hr. endurance test, the necessary runs will be made to obtain a curve of power against speed by varying the load with the throttle wide open. Readings should be made at speeds ranging from 75 per cent. of normal speed to approximately 110 per cent. of normal speed. Each speed should be maintained at least for five minutes before a reading is taken.

5. Inspection—After completion of the block tests, a complete tear-down and detailed inspection of engine parts shall be made, particular attention being paid to excessive wear or signs of failure.

New Wasp Engined Sikorsky Amphibian S-38 Nearing Completion at College Point Plant

THE NEW Sikorsky amphibian Type S-38, powered with two Pratt & Whitney Wasp engines, is nearing completion at the factory of the Sikorsky Manufacturing Corp. at College Point, Long Island, N. Y. It is very similar to the S-36, the Whirlwind model except that the tail surfaces are supported by two outriggers instead of one. The hull is slightly larger, having a greater displacement and seating 10 to 12 persons including the crew. Like the S-36, which was described in AVIATION for Sept. 5, 1927, it has a hull of composite wood and duralumin construction covered with sheet Alclad housing the cabin and passengers. On each side of the hull are short wing stubs supporting the wide upper wing. The upper wing has a span of 71 ft. 8 in. while the lower wing has a span of 35 ft. 10 in. Faired into the lower surface of the upper wing are the two engines with tractor propellers. Behind each engine nacelle is an outrigger supporting the tail surfaces. The plane weighs 5,800 lb. empty and has a useful load of 3,000 lb. It is calculated to have a top speed of 120 m.p.h. and a landing speed of 55 m.p.h.

Focke-Wulf Company of Bremen, Germany, Builds Its First Large Commercial Plane

A SHORT time ago the Focke-Wulf Airplane Construction Co. of Bremen, Germany, completed its first large commercial airplane, the Focke-Wulf "Mowe", or A17. It is a 10 passenger monoplane with a single 420 hp. Gnome et Rhone Jupiter engine. The plane was tested at Adlershof, the German experimental station outside of Berlin, and later delivered to the North German Air Traffic Co. of Bremen for service to the German North Sea resorts.

The Mowe has a very clean appearance with the internally braced monoplane wing set above the fuselage. The landing gear offers very little resistance. There are three members supporting each wheel, two hinge about the lower fuselage longeron while the third, to which the shock absorber is attached, is supported by the wing. Like most Focke-Wulf designs, the fuselage is very low with the two radius members of the landing gear almost horizontal. The shock absorber, of rubber chord, is contained inside the leading edge of the wing, out of the slipstream.

The wing is of interesting design; it is internally braced and tapers in both plan and section. It has a constant chord of 12.14 ft. from the fuselage to a point about seven feet out from where it tapers to the wing tip. The span is 65.62 ft. including the ailerons which project beyond the wing tip. Unlike most designs, the ailerons are not set into the wing

The new Focke-Wulf "Mowe" commercial plane. Note the wide landing gear.

but are hinged to the trailing edge almost as a separate unit. The wing is of wood construction utilizing the plywood covering to take part of the load.

The fuselage is covered with fabric and, in construction, resembles American practice. The truss is of welded steel tubing with the engine mount attached to the forward end by four bolts. The cabin normally houses eight people in seats arranged in pairs with an aisle between them. The two rear seats are set together on one side to leave the entrance to the cabin, on the left, unobstructed. An additional seat may be installed in this space if necessary. Four large windows on each side provide light for the cabin. These may be lowered to ventilate the cabin. In the rear wall of the cabin is a door leading to a compartment divided in half by a longitudinal partition with one half used for the storage of baggage and the other half as a lavatory. It is planned to carry 441 lb. of baggage in this compartment.

Compressed Air Starter Used

The pilot's cockpit is at a higher level than the cabin, with the pilots' heads in the leading edge of the wing. Entrance to this compartment is through a door leading to the cabin. Dual wheel control and conventional rudder bars are used. The stabilizer adjustment is on the left side accessible to the pilot on the right. For starting the Jupiter engine, there is a small compressed air starter installed in this compartment. Below the compartment is a space to be used for either mail or baggage.

The general specifications are as follows: length 42.65 ft., height 10.5 ft., span 65.62 ft., wing area 672.74 sq. ft., wing loading 11.82 lb. per sq. ft., power loading 18.96 lb. per hp., weight empty 4,695.84 lb., useful load 3,262.84 lb., total load 7,958.68 lb., high speed 111.84 m.p.h., landing speed 49.71 m.p.h., climb to 3,281 ft. (1,000 meters) 9 min., climb to 6,562 ft. (2,000 meters) 21 min., ceiling 13,123 ft., take off run 557.74 ft., landing run 492.12 ft.

A.M.L.O. Oil Consumption on Record Seaplane Flight Called Remarkably Low

A.M.L.O. LUBRICATING oil, produced by the Texas Pacific Coal and Oil Co., Thurber, Tex., was used on the two Wright Cyclone (R-1750) engines in the Navy PN-12 which recently established the world's endurance record for seaplanes by remaining in the air 36 hr. 1 min. 13.8 sec. The oil consumption was remarkably low, being approximately one-third the rated consumption. The specific oil consumption per brake horsepower hour was .007 for the port engine and .00975 for the starboard engine. For the flight the port engine used 16 gal. while the starboard engine used 23 gal.

The oil pressure on the port engine is stated to have been maintained at 61 lb. per sq. in. during the entire flight and to have been up to 62 lb. per sq. in. in the 36th hour. The oil temperature ranged from 34 deg. Centigrade to 60 deg. Centigrade with an average at about 55 deg. The average speed of this engine during the flight was 1405 r.p.m.; the speed just after the take off was 1620 r.p.m., and, as the load of gasoline was reduced, the engine speed was decreased until it was 1250 r.p.m. at the end.

The oil pressure of the starboard engine was maintained at an average of 80 lb. per sq. in. during the flight. The pressure was increased in this engine due to the fact that in the first attempt to take off some foreign matter got into the oil relief valve, holding it open and causing the oil pressure to drop. As soon as this was removed the pressure was increased to 80 lb. per sq. in. to keep any other foreign matter from clogging the oil pump. The oil temperature in this engine varied from 40 deg. Centigrade to 75 deg. Centigrade while the r.p.m. were approximately the same as that of the port engine.

The oil used was A.M.L.O. 120 second viscosity at 210 deg. Fahrenheit. This oil was described in AVIATION for Jan. 30, 1928.

Pratt & Whitney Wasp Engines Are Now Used on 20 Types of Commercial Planes

THE 400 hp. Pratt & Whitney Wasp engine is now installed in no less than 20 various types of commercial planes, the manufacturer reports. These craft employing the power plant include land planes, seaplanes, and amphibians, varying in type from the small, individually owned four to five passenger cabin planes to the giant tri-engined passenger and mail planes.

Until the past six months there was only available for commercial installation 400 hp. water cooled engines and 200 hp. air cooled engines. The Wasp, which is the first engine in the 400 hp. air cooled field, is quickly replacing the water cooled engines of this size in commercial work, and it is interesting to note that in many cases where considerably greater performance is desired, it is even replacing the smaller air cooled type. Examples of this latter case are in the Fairchild cabin type, as well as the Fokker Super-Universal.

Newly Inaugurated New York-Atlanta Mail Line is Longest Ever Opened at One Time

ELABORATE CEREMONIES marked the inauguration of the New York to Atlanta air mail line by Pitcairn Aviation, Inc., with headquarters in Philadelphia. The new line, which is 1,242 mi. long and the longest ever opened in the United States at one time, runs from New York to Philadelphia, Washington, Richmond, Va., Greensboro, N. C., Spartanburg, S. C., and Atlanta, Ga., connecting at Candler Field, Atlanta, with a new route to Birmingham, Mobile, Ala., and New Orleans.

Government officials at Washington, and city authorities and civic organizations at other cities along the route, celebrated the inauguration of service on the newest of trunk air mail routes of the country. With the opening of the service, cities in New York State, New Jersey, Eastern Pennsylvania, Delaware, New England and Maryland, are brought one day closer to Alabama, Georgia and other parts of the South. By mailing early enough to make connecting trains, cities not directly on the route will receive the same benefits.

A contract has been given to Pitcairn Aviation, Inc., to operate an extension of the line from Atlanta to Miami, where Pan-American Airways planes to Havana will connect with the air mail. The St. Tammany Gulf Coast Airways is operating the connecting line from Atlanta to New Orleans.

The New York to Atlanta air mail is being flown entirely at night and letters posted at one end of the line are being delivered at the other end in the first delivery the following morning—a run of 760 mi. It is being done as quicky as a letter posted in New York in the afternoon could be delivered in any other part of the same city.

With the bringing of the southeastern section of the United States into the air mail system, every section of the country now has air mail service. Several hours, and often several days, can be saved by sending, by air mail, letters from any other city to another city more than 500 mi. away, the maximum distance on which overnight service can be obtained by railroad trains.

To Meet Proposed Mexican Line

The route will be extended from New Orleans to Laredo, Tex., to meet the proposed Mexican air mail from Mexico City, the government already having asked bids for such a service. The air mail is carried to the South by private companies operating under contracts with the Post Office Department.

Connecting lines of the air mail route operate on schedules so that they arrive and leave just before and after the departure and arrival of the New York to Atlanta planes. This overnight schedule is available over the entire route, 1,400 mi., between Boston and New Orleans, saving two days between New England and Louisiana.

The northern terminus of the line at New York is at Hadley Field, New Brunswick, N. J., and the southern terminus is at Candler Field, Atlanta. James G. Ray, chief of operations for Pitcairn Aviation, Inc., is in charge of the line. Stops are made at the Philadelphia Airport, Philadelphia; Washington, D. C.; the Richard E. Byrd Flying Field, Richmond; the Greensboro Municipal Airport, Greensboro N., C., and the Spartanburg Municipal Airport, Spartanburg, S. C. At New York, the Atlanta to New York line connects with the transcontinental air mail line and the Boston air mail line.

Various industries in the south with New York offices are enabled to transact a vast amount of business by air mail. Transmission of orders, handling of branch office correspondence, and the general dispatch of business, can all be taken care of by air mail.

The air mail passes through six federal reserve districts—Boston, New York, Philadelphia, Richmond, Atlanta, and New Orleans—and serves many summer and winter resorts. The schedule is as follows:

SCHEDULE

Southbound Read down		Northbound Read up
Lv. 8:00 p.m. (E.T.)	...New York... Ar.	6:15 a.m. (E.T.)
9:40 p.m.	.New Brunswick. Ar.	4:35 a.m.
10:24 p.m.	..Philadelphia.. Lv.	3:56 a.m.
11:45 p.m.	...Washington...	2:35 a.m.
1:02 a.m.	....Richmond....	1:28 a.m.
2:59 a.m.	...*Greensboro...	11:21 p.m.
4:32 a.m.	..Spartanburg..	9:50 p.m. (E.T.)
Ar. 5:17 a.m. (C.T.)	.....Atlanta..... Lv.	7:00 p.m. (C.T.)

(Closing time, at New York General Post Office, 6:30 p.m.)
(At Atlanta General Post Office, 5:30 p.m.)
*Winston-Salem and High Point served via Greensboro Airport.

Travel Airways Company of Dallas, Tex., Makes Six Airplane Sales in Fast Time

A SELLING rally has been on recently at Travel Airways, Dallas, Tex., inasmuch as the company has delivered six Travel Airs during a two-week period. Howard Woodall, W. B. McAllister, Leroy Lucky, and Tilden Johnson have been devoting most of their time to ferrying in planes from the factory at Wichita, Kan., to points of delivery.

An OX-5 and an OXX-6 were delivered to L. L. Stevenson, San Antonio. He received the OXX-6 at Dallas and the OX-5 was delivered to him at San Antonio. A J-5 Whirlwind biplane was delivered to J. Warren Miller, Farmington, N. M. Mr. Miller is an oil operator and uses his plane to look after his oil interests. This is his second Travel Air, the first being an OX-5.

Lee Wilson of Rose-Wilson Co., authorized Ford dealer of Dallas, has purchased an OX-5. Lee is one of Love Field's old timers. W. R. Eason, Travel Air dealer at Waco, has received delivery of an OX-5. Marvin Young and T. J. Haire, Dallas, have purchased a Travel Air OX-5.

Arkansas Aircraft Corp. Increases Price Of OX-5 Command-Aire Biplane to $3250

A RECENT announcement from the Arkansas Aircraft Corp., Little Rock, Ark., states that the price of the Arkansas Command-Aire powered with a Curtiss OX-5 engine has been increased to $3250 from $2950. The new price includes considerable extra equipment. It will be recalled that the Command-Aire is a conventional biplane with an exceptionally wide center section and wide landing gear of the split type. The radiator is mounted on the nose between the V of the cylinders in front of the engine. The plane was described in detail in AVIATION, Feb. 6, 1928.

Curtiss Flying Service Orders Nine More Training Planes and Adds New Instructors

NEW INSTRUCTORS associated with the Curtiss Flying Service are Hammon, McMahan, A. Jordonoff, Lieut. John A. Battle. Jordonoff is a Bulgarian pilot who has been with Curtiss previously, both as instructor and engineer. McMahan will do cross-country flying as well as instruct.

The Curtiss Flying Service has ordered for training work three Wacos, three Eaglerocks, and three new Jennies with wings by Sikorsky, the latter being monoplanes. In addition, six Curtiss Robins, cabin type planes, are to be added to the list.

Avro-Napier "Buffalo" is New Type Airplane Constructed for the British Air Ministry

THROUGH THE courtesy of D. Napier & Son Ltd., London, England, AVIATION has obtained a photograph and some data on one of the latest planes constructed for the British Air Ministry. The Avro-Napier "Buffalo" is a single engined biplane (Napier Lion engine) designed for bombing, reconnaissance, and torpedo carrying. The undercarriage may be either wheels or pontoons. To facilitate storage on board ship, the wings are designed to fold back. The machine is

Newly completed for the British Air Ministry, the "Buffalo" is designed for bombing, reconnaissance, and torpedo carrying.

designed to carry heavy loads. It has two seats in tandem with the roomy gunners' cockpit in the rear. There is a sliding floor in the bottom of the fuselage to facilitate bomb sighting and dropping. The Buffalo has a top speed of 134.6 m.p.h. and a cruising speed of 110 mp.h. It has a fuel capacity for 6½ hr.

N.A.T. Issues Quarterly Report on Air Mail Poundage, Express, and Passengers

IN THE first quarter of the current year, National Air Transport, Inc., carried 177,505 lb. of mail according to figures recently revealed by that company. The air express carried during that period totaled 8,377 lb. making a total cargo of 185,882 lb. Two hundred and sixty-nine passengers, of which number 72 were carried in March, were transported between various points on the line during the three months period. There are no comparative figures for this three month period since the National Air Transport only took over operations of the New York-Chicago route last September.

The March air mail poundage of 59,864 lb. indicates a steady increase in the use of the air mail as compared with the figures for February, 48,454 lb., and January, 49,187 lb. For December, 1927, the air mail poundage was 51,060 lb. but that figure included the Christmas mail and March has exceeded that figure by more than 8,000 lb.

The March air mail poundage checked as follows:

Chicago-Dallas overnight route	9,405 lb.
Chicago-Kansas City day route	3,192 lb.
Chicago-New York day flight	29,542 lb.
Chicago-New York overnight	17,725 lb.
Total	59,864 lb.

Passenger carrying also received impetus with the coming of warmer weather in March. Although the mail planes used on the New York-Chicago line have accommodations for only one passenger, 34 were carried in March on that line. Thirty-eight passengers were carried in the three passenger cabin monoplanes operating between Chicago and Kansas City daily during the same period. No passengers are carried on any of the night planes.

More Than a Hundred Planes Participate In Air Circus Held at Kansas City, Mo.

THE BIGEST air event ever held in Kansas City, Mo., took place May 6 when an air circus was staged under the auspices of the Kansas City Air Corps Reserve Officers Association and the aeronautical committees of the Chamber of Commerce. More than a hundred planes participated in the events with the crowd estimated at between 60,000 and 75,000.

One of the distinguished visitors for the event was William P. MacCracken, assistant secretary of commerce for aeronautics, who arrived there the day before in a plane.

Widely known commercial pilots, and Army fliers from every post within 250 mi. of Kansas City, were present and participated in the competition.

The events and the winners:

Event 1—3,000 ft. climb for planes engined with 100 hp. or less. Won by Tex LaGrone in a Waco 10 plane; prize $25.

Event 2—Kansas City Power and Light Co. 30 mi. race for planes engined with 100 hp. or less. First prize of $50 to George E. Halsey in a Lincoln-Page plane. Second prize of $30 to Fred Kane in an Eaglerock plane. Third prize of $20 to A. B. Johnson in a Travel Air plane.

Event 3—Butler Manufacturing Co. 30 mi. race for planes engined with 100 hp. or less. First prize of $50 to Tex La-Grone in a Waco 10 plane. Second prize of $30 to L. D. Rush in an American Eagle plane. Third prize of $20 to A. B. Gabbert in a Keokuk experimental plane.

Event 4—G. B. Richards 30 mi. race for planes powered with 300 hp. or less. First prize of $50 to Francis ("Chief") Bowhan in a Cessna plane; second prize of $30 to C. W. Myer in a Waco plane; third prize of $20 to Dorsey Askew in a Travel Air plane.

Event 5—Spot landing contest. First prize of $25 to Charles Gatchet in an American Eagle plane; second prize pair of goggles to Tex LaGrone in a Waco 10 plane; third prize, pair of goggles to L. D. Rush in an American Eagle plane.

Event 6—Kansas City Bankers' race between winners of events 2 and 3. First prize of $75 to George E. Halsey in a Lincoln-Page plane; second prize of $50 to Fred Kane in an Eaglerock plane; third place, no prize, to Tex LaGrone in a Waco 10 plane.

Philadelphia to Put Its Airport in Shape Following Warning From Postmaster Kemp

MAYOR MACKEY has been notified by Postmaster George E. Kemp that Philadelphia will lose its air mail flying service unless the municipal flying field at Island Rock and Tinicum Ave. is immediately put into such a condition that it will be safe for aviators to land. The postmaster was acting on instruction from Washington in the matter.

"The field will be put in perfect condition", Mayor Mackey said after receiving the ultimatum from the Government officials. "It will be made safe if we have to use private funds to do so and ask for reimbursement from the city council later. I am determined that the air mail service shall not be lost to Phialdelphia because of any failure of the municipality to provide a safe landing place."

Pacer Aircraft Corp., Perth Amboy, N. J., Is Now Producing Four Place Monoplanes

THE PACER Aircraft Corp., Perth Amboy, N. J., has started production on the Pacer monoplane, an externally braced, high wing design powered with either a 180 hp. Wright-Hispano engine or a Wright Whirlwind. The first Hispano model is undergoing tests at Hadley Field, N. J., and, at the time of this writing, the first Whirlwind model is nearing completion. It is a four place, open cockpit, parasol type designed by F. R. Seesock.

The plane has a welded steel tube fuselage and wood wings covered with fabric. The wings are supported by struts having an airfoil section capable of lifting their own weight at

Pacer monoplane over Hadley Field, New Brunswick, N. J.

72 m.p.h. According to the manufacturer the Hispano model has a high speed of 138 m.p.h. and a landing speed of 42 m.p.h. It will climb at 1500 f.p.m. and will carry a useful load of 1200 lb. which includes 70 gal. of gasoline. With the same landing speed, the Whirlwind model is calculated to have a high speed of 147 m.p.h. and a climb of 1650 f.p.m. It carries the same load.

Woodworking and Metal Shop Completed By Ludington Philadelphia Flying Service

THE LUDINGTON Philadelphia Flying Service has completed a new $12,000 woodworking and metal shop at the Philadelphia Airport, swelling its investment at the field to $140,000. The new structure is the fourth building erected by the company since it started operations at the airport last year.

The woodworking shop is 40 by 72 ft. and the metal shop is 40 by 100 ft. The building is equipped with 50 ft. doors so that planes can be run into the shop for repairs. Complete welding and metal working outfits, machines for the cutting of fittings, and other equipment capable of handling any type of metal manufacture or repair work for planes, have been installed in the new building. The woodworking shop has been equipped with planes, saws, woodworking machines and other equipment for the repair and maintenance of airplane wings of any type.

Five planes have been started through the shop for complete rebuilding and overhauling, according to R. Sanford Saltus, vice president. Nineteen skilled aviation workers are employed in the new building, with Robert J. Phillips, who has had 15 yr. experience in such work, in charge, and W. P. Rimel supervising wing work.

When the Ludington company started operations at the Philadelphia Airport on April 1, 1927, four employees were on the payroll. Today there are more than 30, with additions being made almost monthly.

Pratt & Whitney 525 Hp. "Hornet" Engines Now Available for Commercial Installation

"HORNET" ENGINES manufactured by the Pratt & Whitney Aircraft Co. of Hartford, Conn., are now available for commercial installation, it has been announced. To date the Navy Department has absorbed the entire production of this 525 hp. power plant.

The Boeing Air Transport Co., operating the mail route from Chicago to San Francisco, already employs 16 Hornets in the regular mail service, with a further quantity still on order. The smaller "Wasp" engine has been used by this company throughout the last year, but the mail loads have increased at such a rapid rate that it has become necessary to employ the larger Hornet engine. The first of the Hornet engines has now flown several hundred hours with entire success, it is stated.

A number of other Hornets have been furnished to various plane designers, including Hamilton, Bellanca, and the Ford Motor Co., and new commercial planes around this engine are expected at an early date.

Name Three Service Teams to Compete In Elimination Balloon Races on May 30

THREE TEAMS have been named by the War Department to represent the Army Air Corps in the National Elimination Balloon Races at Bettis Field, Pittsburgh, on May 30. The teams are: 1. Capt. William E. Kehner, pilot, with 2nd. Lieut. William O. Eareckson as aide, 2. Capt. Edmund W. Hill with 2nd. Lieut. Henry G. Fischer as aide, and 3. 1st. Lieut. Paul Evert with 2nd. Lieut. U. G. Ent as aide. Members of the first two teams are stationed at Scott Field, Belleville, Ill., while those of the third team are at Langley Field, Va.

The Gordon Bennett International Balloon Race, of which the Pittsburgh competition is a preliminary, will be held this year from Ford Airport, Detroit, on June 30. Besides the United States teams, there will be entries from Belgium, Germany, France, England, Switzerland, Denmark, Argentina, and Spain in this classic.

To Hold Air Meet May 26-27 as Formal Dedication of Airport at Endicott, N. Y.

AN AIR meet at the city airport west of the town will be held May 26-27 at Endicott, N. Y., it has been announced. The Endicott Aero Club, Inc., is sponsoring the affair, which marks the formal opening of the new field. Jack Ashcraft is managing the event.

For various races and exhibitions, cash prizes and silver loving cups will be offered. Passenger carrying by visiting pilots will be permitted on both days.

The Endicott Aero Club announces that all airmen are especially invited to attend the meet. Special preparations are being made for their reception.

Stinson and Buhl Company Sales Reports Indicate Stimulation of the Detroit Show

A CROSS-SECTION glimpse of the stimulation of business in the aircraft industry credited to the All-American Aircraft Show is seen in reports made by two of the three major airplane manufacturing concerns of the Detroit area. The reports are those of the Stinson Aircraft Corp. and the Buhl Aircraft Co. A report from the Ford Motor Co. was not available.

During and just prior to the All-American Aircraft Show the Stinson Company sold 13 monoplanes, one biplane and 12 Stinson-Detroiter Juniors, the company's latest product shown publicly for the first time at the show. The sales, according to William A. Mara, secretary of the company, totaled $253,000, with $173,000 of the total being in the large type plane, and $7,800 in the smaller type.

The Buhl Company booked nine orders during the show, three "Airsedans" going to three different purchasers. In addition, according to Charles Hughes, general manager of the company, a large number of prospective sales are in the offing because of contacts made during the show. The company now is six planes behind orders, Hughes stated.

"The All-American Aircraft Show," Hughes said, "undoubtedly proved a great boon to the industry. It served to educate the public and the business world regarding the enormous strides taken by our industry, and brought them face to face with the indisputable advantage of transportation by air."

Purchasers of Buhl "Airsedans" during the week of the show were the De Luxe Airlines of Wichita, Kan., the Mamer Flying Service of Spokane, Wash., and Fred L. Foster, oil man of Tulsa, Okla.

The Stinson Sales

The Stinson Company's sales were as follows: Large monoplanes: Brown Lipe Gear Co., Syracuse, N. Y.; Pilot Electric Manufacturing Co., Brooklyn, N. Y.; Harry C. Bovay, Memphis, Tenn., bridge builder; Seymour Fowler, Lansing, Mich.; William K. Guyney, Pittsburgh, Penna., engineer; General Electric Co., Schenectady, N. Y.; E. T. Wolfe, publisher *Ohio State Journal*, Columbus; Thompson Aeronautical Corp., Cleveland Stinson distributor; four monoplanes Cardinal Flyers, Inc., Louisville, Ky.; Packard Electric Co., Warren, O.

Juniors: Union Trust Co., Detroit; Jack T. Byrne, Memphis, Tenn.; D. B. Richardson, Sao Paulo, Brazil distributor; North American Airways, Appleton, Wis.; Henry De Baufer, Appleton, Wis.; Fred H. Taylor, Watertown, N. Y.; A. L. Pitz, of Manitowac Shipbuilding Corp., Manitowac, Wis.; Warner Aircraft Corp., Detroit; D. W. Moore, Cherow, S. C.; Earl T. Vance, Great Falls, Mont., (two Juniors); and King Advertising Agency, Cleveland, O. The biplane was sold to the Purple Label Airlines, Ltd., of Calgary, Alberta, Canada.

Air Service Corp. of Oklahoma City Formed With Three Planes Now in Passenger Work

THE AIR Service Corp. of Oklahoma City was recently formed following the organization of the Air Service Lines of Tulsa. Three planes in service transporting passengers are already property of the company, and student instruction, aerial photography, and other activities are planned by the group.

H. W. Parker, Lee B. Bradway, P. H. Mullins, and J. R. Green are incorporators of the concern. Parker, manager of the National Air Transport Co. at Oklahoma City, is president and manager of the new business. Bradway is a city contractor, Mullins an auditor, and Green an attorney.

Hangar space for three planes of the company is being constructed on the west side of the Municipal Airport. A long wing Eaglerock plane, a new Travel Air, and a Curtiss JN4-D are the planes of the company.

European Aeronautical Engineers in U. S. To Sell Patents on New Helicopter Design

TWO EUROPEAN aeronautical engineers, Theodore Bobrovsky of Budapest, and Herman Parenzan of Trieste, have come to the United States to sell the patents on a helicopter designed by them and tested in the wind tunnel in Trieste. The device resembles an internally braced, high wing monoplane with a propeller mounted in the leading edge of each wing. There is a third propeller mounted above the tail surfaces. The axis of each propeller is vertical, thus providing the thrust in a vertical direction. The main wing has an airfoil section and is mounted so that its angle of incidence can be changed.

To take off, it is planned that the chord of the wing will be vertical. After the plane is in the air the angle of attack is to be decreased until forward motion results. The axis of the propeller is always mounted vertically. All propellers are driven from a central power plant in the fuselage by torque tubes. The drive for the wing propeller is carried in the leading edge of the wing and the wing rotates about this point. According to the designers, the wind tunnel tests are very promising.

Air Mail Founder is En Route to Siam To Supervise Aerial Postal Development

OTTO PRAEGER, called "Daddy of the Air Mail", is now visiting in San Francisco prior to sailing from that port on May 22 for Siam where he will supervise the development of an air mail system. This Asiatic monarchy, Praeger declares, has shown a marked development in aviation since the World War.

While serving as second assistant postmaster general of the United States, Praeger was in charge of establishing the first air mail route—a line between Washington and New York City. This line was put in operation on May 15, 1918, and the week of May 13-19 has just been celebrated as the 10th anniversary of the air mail.

Stunting Causes 80 Per Cent. Naval Aviation Accidents, Declares Rear Adm. R. H. Leigh

EXCESSIVE NAVAL aviation accidents were laid to the failure of pilots to abide by rules against stunt flying, in a statement made by Rear. Adm. R. H. Leigh, chief of the Bureau of Navigation, who recently explained the purpose and scope of the inquiry being conducted by the special board appointed by Secretary of the Navy Wilbur. A crash analysis, according to the Admiral, shows that 20 deaths occurring in 1927 were caused by stunting, bringing fatalities of this type to 80 per cent.

Bill is Passed in Senate Which Permits Grant of Long Term Air Mail Contracts

A NEW measure recently passed by the Senate in the form of an amendment to the Air Mail Act of 1925 permits the Postmaster General to issue certificates to air mail contractors giving right of air mail transport for a period not to exceed 10 yr. Satisfactory operation for two years or more under the act is required for long contract eligibility.

Storms Delay Loening Amphibian Flight To Retrieve Bremen from Greenely Island

STORMS ARE delaying the retrieval of the trans-Atlantic Junkers monoplane Bremen, at this writing. Maj. Gen James E. Fechet, chief of the Army Air Corps and commander of the two Loening Amphibian rescue planes, is at Pictou, N. S., with his pilot, Lieut. Elwood R. Quesada, awaiting better flying conditions for the continuation of the trip to Greenely Island. The second amphibian, piloted by Capt. Ira C. Eaker and bearing Fred Melchior, Junkers pilot who is to bring the Bremen to New York, has been forced down in a snow storm some 30 mi. short of Pictou.

The two Loening Amphibians left Bolling Field, Washington, on May 11 and were flown to Miller Field, Staten Island, N. Y. On May 12 the journey was continued to Portland, Me., and St. John, N. F., after Fred Melchior had been picked up at Mitchel Field, L. I., N. Y. Up to this time, Lieut. Muir S. Fairchild had piloted the second plane, but he was forced to give his place to Lieutenant Quesada at St. John because of falling ill with appendicitis. The flight was again continued from St. John on May 14, only to be stopped by adverse weather in the Pictou vicinity.

If landing conditions are poor on the mainland tract near Greenely Island, to which the Bremen has been removed, Melchior will drop by parachute. General Fechet's party in the Loening planes will await the Junkers pilot. If he is successful in getting the Bremen into the air, the three planes will fly south together immediately; but if trouble is encountered in removing the all-metal monoplane, then other arrangements will be made.

Government Officials Confer With New York State Committee on Promotion of Aviation

A CONFERENCE on aviation between officials of the Departments of War, Commerce, and the Navy and a New York State legislative committee is being arranged, at this writing, to be held on May 19. At that time, the four assistant secretaries in charge of Government aviation will confer with the New York group in the office of Assistant Secretary of War F. Trubee Davison in Washington. Among those attending will be Assistant Secretary of Commerce William P. MacCracken, Jr., Assistant Secretary of the Navy Edward P. Warner, and Assistant Postmaster General Warren I. Glover.

The Joint Legislative Committee, which is the first of its kind in this country, will make a study of Federal and state government promotion of commercial aviation. Relation of the state airways to national defense will also be examined.

The New York committee, headed by State Senator J. Griswold Webb, whose name was carried by New York's recent aviation bills, will fly to Washington for the conference, it is said. A Curtiss plane, piloted by "Casey" Jones of the Curtiss company, and a Fairchild cabin plane, with Lieutenant Ronne at the controls, will carry the group. Members of the committee are Senators A. Spencer Feld and Henry D. Williams, and Assemblymen Gordon C. Ferguson, Herbert B. Shonk, Willis H. Sargent, and Ansley B. Barkowski.

Texas Air Transport Co. Beginning Regular Dallas to Houston and San Antonio Service

REGULAR AIRPLANE passenger service is being inaugurated by the Texas Air Transport Co. over two lines from Dallas, Tex., to Houston and San Antonio, Tom Hardin, chief pilot, announces. Two Ryan cabin monoplanes have been ordered for the service, and one of them has already been delivered from the factory at San Diego, Calif., by Mr. Hardin. Additional passengers will be carried in Pitcairn Mailwing planes, it is announced.

The Texas Air Transport Co., which is contractor for Texas air mail routes, maintains headquarters at Fort Worth and keeps field representatives along the air mail route in Dallas, Waco, Houston, Galveston, San Antonio, and Austin. The company also operates a flying school at the new Houston airport.

State Air Tour Conducted in Oklahoma As the Cities Observe "Aviation Week"

GOV. HENRY S. Johnson set aside the week of May 14-19 as "Aviation Week" for Oklahoma. During this period the Oklahoma State Air Tour was being conducted, and Air Mail Week was also being observed. In Oklahoma City, Boy Scouts distributed 20,000 blotters containing air mail schedules, and special letters were sent to heavy buyers of postage urging them to use the air mail.

Cities visited by the state air tour were: Oklahoma City, the starting point, El Reno, Guthrie, Ponca City, Enid, Altus, Chickasha, Norman, Duncan, Ardmore, Durant, Wewoka, Holdenville, Bristow, Okmulgee, Miami, Bartlesville, and Tulsa. More than 25 planes were entered.

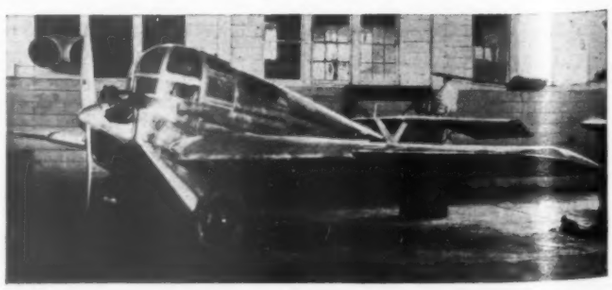
The tour was backed by the Oklahoma State Chamber of Commerce, which secured many airports for cities by the air tour and also stimulated much interest for commercial aviation. The Texas Company's tri-engined Ford, two Ryan Broughams, two Stinson cabin planes, three Spartans, Travel Airs, Eaglerocks, Wacos, and American Eagles were planes entered in the tour.

No unnecessary acrobatics or maneuvers were permitted in the tour. No prizes were offered of any sort as the tour was not a contest. M. H. Kotzebue, Oklahoma National Aeronautic Association governor, was commander, Carl E. Humphreys, president of the State Chamber of Commerce was manager, and Billy Burke of Okmulgee was flight leader.

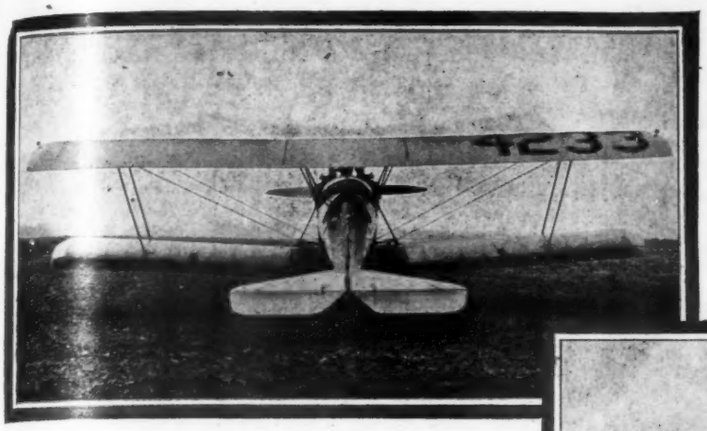
The general aviation committee of the State Chamber of Commerce arranged the tour. R. H. Berry of Tulsa was chairman, while D. A. McIntyre, Glenn Condon, Charles Parker, C. C. Roberts, H. C. Martin, A. E. Warner, Burrell Tibbs, Billy Parker, and H. C. Mulroy were members of the committee.

Several months' preparation were made before the start, and the success of the tour was the result, as well as great good will feeling toward aviation among the people of the state.

A Radically Different Monoplane



Variable camber wing monoplane, designed by Marvin Dane of the Dane Aircraft Corp., Detroit, and recently tested at Mt. Clemens, Mich. The wing area is now being increased, and an Anzani engine is being placed in the craft. A short news item describing the plane's construction appeared in AVIATION *for May 7, 1928.*



Especially for Private Owners

THE PITCAIRN SPORT MAILWING

In the Pitcairn Sport Mailwing there is offered a quality and degree of performance that accords it a unique position. It is a sport ship with all service characteristics of the finest types of planes used in the air mail service, and as such, appeals to the most discriminating class of owner-pilots.

It is a companion ship to the familiar Pitcairn Mailwing*, only differing by the conversion of the mail compartment to an additional cockpit for passenger-carrying. There is also added a baggage compartment directly behind the pilot's seat.

The Pitcairn Sport Mailwing answers the demand of private owners for a plane of wide speed range, remarkable stability, and of the highest maneuverability. It is powered with the Wright Whirlwind J-5-C engine and furnished with the following instruments and equipment:—

Instruments	*Equipment*
Compass	Navigation Lights (Also wired for landing lights)
Altimeter	Flare Release Mechanism
Air Speed Indicator	Fire Extinguisher
Tachometer	Battery
Gas Gauge	Engine Tools
Oil Pressure Gauge and Thermometer	First Aid Kit
Clock	

Price, fully equipped at Bryn Athyn, Pa., $9,850. Send for illustrated literature and complete specifications.

*Reg. U. S. Pat. Off.

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1865 LAND TITLE BUILDING · · PHILADELPHIA, PA.

THANK YOU *for mentioning* AVIATION

Last Minute Briefs

D. D. Johnson of West Hazleton, Penna., has been awarded the dealership of Lincoln-Page planes in 15 counties of Northeastern Pennsylvania. Johnson has purchased a Lincoln-Page from the United Air Transport, Inc., of Philadelphia, Pennsylvania and New Jersey distributor.

The Atkinson Aviation Co. of Gary, Ind., has been named Indiana distributor of Monocoupe planes. The first of an order for 15 of these planes will be received this month.

The Federation Aeronautique Internationale has recognized the sustained flight record of 53 hr. 36 min. 30 sec. established by Edward A. Stinson and George W. Haldeman in a Stinson-Detroiter plane March 28-29-30 at Jacksonville, Fla.

Officials of the Breese Aircraft Co. of San Francisco announce that the company is again in production of planes. Two will be completed in May with an increase in June and each succeeding month.

The Omaha-Winnipeg Airway Association, the formation of which was announced last week in AVIATION, has been informed by the postal department that an air mail line between the cities is not feasible at this time because of lack of business warranting it.

An agency for American Eagle planes in Oklahoma has been taken by the Oklahoma Air Transport Co. at Norman. The company has been in operation several years.

The United States Senate has now passed the House bill authorizing reduction in air mail postage rates from ten to five cents for each ounce or fraction of an ounce.

Under the organization of Roland H. Spaulding, a course in aeronautics will be offered in the New York University summer school this year. The Daniel Guggenheim Fund for the Promotion of Aeronautics has arranged for the instruction.

Feasibility of dirigible contact with ships at sea was further demonstrated recently when the Army non-rigid airship TC-5 landed on an after-deck platform of the steamer *American Trader,* lying off Ambrose Light, and took off a passenger and mails.

Capt. George H. Wilkins and Lieut. Carl B. Eielson, who flew across the North Polar regions, have arrived at Tromsoe, Norway, aboard the *Hobby* from Spitzbergen. Their Lockheed Vega plane was flown across a six mile ice-bound stretch from Green Harbor to the *Hobby,* upon which it was placed to be carried south.

The Consolidated Instrument Co. of America, Inc., New York City, reports receipt of a contract from the Alexander Industries of Denver for 1200 Consolidated Type A aircraft instrument panels.

The Haskelite Manufacturing Corp., maker of plywoods, Haskelite, and Plymetl, recently moved to larger quarters at 120 S. La Salle Street, Chicago. The new offices are on the same floor as the Vitrolite Company and other Meyercord interests.

Franklin Rose and Sam Metzger, Oakland, Calif., pilots, have taken the agency for Stearman biplanes, manufactured by the Stearman Aircraft Co., Wichita, Kan. Rose and Metzger will be sub-dealers under Walter Varney of the Varney Air Lines.

Grover Loening, head of the Loening Aeronautical Engineering Corp. of New York, has purchased the DH Moth plane imported by Air Associates, Inc., of New York. The Moth is equipped with Handley-Page slotted wings.

Rolls-Royce, Ltd., of England has brought out two new engines, the F-11 and F-12, water cooled, V type engines of 12 cylinders, differing only in gear ratio. They are rated at 490 hp. and are said to develop 535 hp. The weight is 865 lb., while the rated crankshaft speed is 2,250 r.p.m. and the propeller speed of the F-11 is 1,421 and 1,244 for the F-12.

Scientists and aviation leaders assembled at Langley Memorial Laboratory, Langley Field, Va., on May 15 for the third annual aircraft engineering research conference under the direction of the National Advisory Council for Aeronautics.

Pan-American Airways, Inc., reports 120 passengers and 31,650 lb. of mail carried between Key West and Havana in the month of April. Eight passenger Fokker cabin planes powered with three Whirlwind engines are used over the route.

A new system of combination air and rail passenger transportation across the continent is planned by a combination of companies among which are the Curtiss Aeroplane & Motor Co., the Wright Aeronautical Corp., the National Air Transport Co., the Pennsylvania Railroad, and the Atchison, Topeka, & Santa Fe Railroad. C. M. Keys, president of the Curtiss company, heads the combination.

Van Lear Black, Baltimore publisher and aviation enthusiast, is now en route to Tokio from London in a three-engined Fokker plane he has hired to take him to the Japanese capital and back—a trip of 40,000 mi.

The North Star Aircraft Corp. has been organized in Minnesota with $50,000 capital. Capt. Hoseas Mohlar is president of the company whose headquarters are located at St. Cloud, Minn.

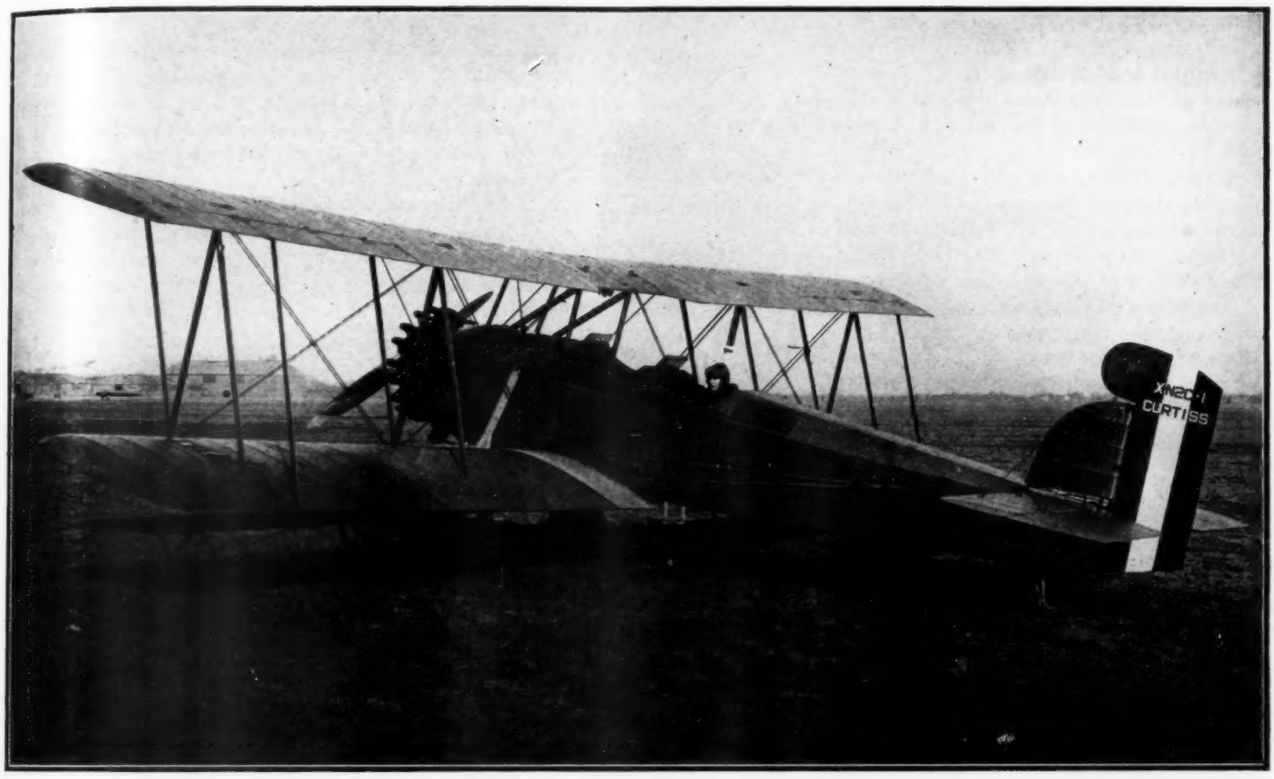
Grays Harbor Airways of Aberdeen, Wash., will begin production of the Activian monoplane as soon as the stress analysis is completed. Special jigs, dies, and machinery have been gathered for the manufacture.

A new Junkers plane has been brought from Germany and assembled at Curtiss Field, L. I., N. Y. The plane is a duplicate of the Bremen; and since the cabin has not been finished for passengers, the plane would be very suitable for a trans-Atlantic flight.

The Junkers Corp. of America now has a set of jigs and dies at Curtiss Field, enabling the manufacture there of Junkers planes.

A course in navigation and meteorology has been begun at Western College of Aeronautics, Los Angeles, with an initial enrollment of 34. John C. Simpson is instructor of the new class.

A NEW TRAINING PLANE



The Curtiss Fledgling

THE FLEDGLING was constructed as the winner of a Navy design competition, in which fourteen leading aircraft manufacturers participated.

It is specifically designed for primary and advanced training, either as a land plane or as a seaplane, and is equipped for fixed and flexible gunnery instruction, radio spotting, and bombing.

In design and performance, the Fledgling is eminently representative of 1928 standards for training planes.

The CURTISS AEROPLANE & MOTOR CO., Inc.

Offices: Garden City, N. Y.; Factories: Garden City and Buffalo, N. Y.

Curtiss

THANK YOU *for mentioning* AVIATION

Nineteen Seaplanes Fly in Curtiss Marine Trophy Race at the Anacostia Air Station

PREPARATIONS FOR the Curtiss Marine Trophy Race at the Naval Air Station, Anacostia, D. C., are being made as AVIATION goes to press. Nineteen seaplanes of five different types will participate in the competition, which is to be held Saturday, May 19. The winner of the race, in which commissioned airmen of the Navy and Marine Corps will fly, will be awarded a miniature of the Curtiss trophy, which was presented to the Navy Department in 1915; while the large trophy, on exhibition at the Navy Department, will be engraved with the winner's name.

A special prize cup will also be awarded by Edward P. Warner, assistant Secretary of the Navy for Aeronautics, and the *Washington Star* will present gold wrist watches to class winners. The prize cup is to be awarded for the best speed attained by a plane regardless of class.

Two of the 19 pilots will represent the Marine Corps, while the remainder will fly under Navy colors. The five events, pilots, and planes are as follows.

SINGLE-SEATER CURTISS FIGHTING PLANES

Lieut. Com. A. C. Miles, Denver, on duty at the Naval Air Station, Anacostia.

Capt. Harold C. Major, Marine Corps, Ames, Ia., on duty at the Bureau of Aeronautics.

VOUGHT "CORSAIR" OBSERVATION PLANES

Lieut. Com. W. K. Harrell, Knoxville, Tenn., aide to Assistant Secretary for Aeronautics.

Lieut. F. R. Buse, Ridley Park, Pa., on duty at Naval Air Station, Anacostia.

Lieut. Com. Ralph E. Davison, St. Louis, on duty at Navy Department.

LOENING AMPHIBIAN OBSERVATION PLANES

Lieut. (Junior Grade) B. E. Grow, Red Wing, Minn., on duty at Naval Air Station, Hampton Roads, Va.

Lieut. H. S. Busbey, Marine Corps, Marine Barracks, Quantico, Va.

Lieut. Com. George Chapline, Lincoln, Neb., on duty Bureau of Aeronautics. Lieut. De Long Mills, New York City, on duty Lakehurst, N. J.

MARTIN TORPEDO PLANES

Lieut. W. J. Slattery, San Francisco, on duty VT Squadron 9, Scouting Fleet.

Lieut. D. V. Gallery, Chicago, on duty VT Squadron 9, Scouting Fleet.

Lieut. (Junior Grade) R. W. D. Woods, Cambridge, Mass., on duty VT Squadron 9, Scouting Fleet.

Lieut. (Junior Grade) E. S. Mulheran, Washington, on duty VT Squadron 9, Scouting Fleet.

Lieut. (Junior Grade) A. Handley, San Catalina, Cal., on duty VT Squadron 9, Scouting Fleet.

Lieut. (Junior Grade) J. C. Waldron, Fon Pierre, S. C., on duty VT Squadron 9, Scouting Fleet.

CONSOLIDATED TRAINING PLANES

Lieut. M. R. Browning, Coronado, Cal., on duty Naval Air Station, Hampton Roads, Va.

Lieut. J. A. Pennington, Deering, Ga., on duty Naval Air Station, Hampton Roads, Va.

Lieut. (Junior Grade) R. E. Blick, Michigan City, on duty Naval Air Station, Hampton Roads, Va.

Lieut. W. G. Tomlinson, Kansas City, Mo., on duty Naval Air Station, Anacostia.

Northwest Aircraft Show Opens May 24 On Wold-Chamberlain Field at Minneapolis

EVERYTHING IS now in readiness for the opening of the Northwest Aircraft Show at Wold-Chamberlain Field, Minneapolis, Minn., on May 24. The show, sponsored by the newly formed Aircraft Association of Minnesota, will be four days in length. H. E. Wilcox is manager.

All activities of the Northwest Aircraft Show, the first of its kind in this section, will be centered at the airport where two tents for exhibits have been erected. A nominal charge of $1 per square foot has been made for exhibition space in the 100 by 200 ft. canvas structures.

In addition to displays by local distributors and manufacturers, several companies from other sections of the United States are to be represented, it is reported. Among the exhibits will be a number of new production planes, engines, instruments, and various accessories. Flights and demonstrations of various kinds will take place at the field.

Some of the distributors, manufacturers, and operators to be represented are the Minnesota Aircraft Co., Minneapolis; the Pioneer Airways of St. Paul; the Roth-Downs Airways, Inc., of St. Paul; the Northrup Airplane Co. of Minneapolis; the Mid-Plane Sales and Transit Co. of Minneapolis; the Mohawk Aircraft Corp. of Minneapolis; and the Northwest Airways, Inc.

Airport at Marion, Ill., Will be Dedicated Sunday, May 27, by Flights and Exhibitions

MARION AIRPORT, Marion, Ill., will be dedicated on Sunday, May 27, it has been announced by officials of the new field. At least 60 planes as well as U. S. Government dirigibles from Scott Field are expected to participate in the exhibitions that day, which will include various flights and performances.

The Mid-Continent Petroleum Corp., it is said, will furnish free gasoline to all guests. Planes wishing to carry passengers from the field may do so on an 80 per cent. basis, according to H. E. Barber, chairman of the airport committee, who invites all pilots to attend the opening of the airport.

New Plant Has Been Taken by Paramount Welded Aluminum Products Corp., Brooklyn

PARAMOUNT WELDED Aluminum Products Corp., formerly located at 40-42 South 8th St., Brooklyn, N. Y., has moved to 429-431 Kent Avenue, Brooklyn. The change was made necessary by the greatly increased volume of business that the company is handling. The new quarters are nearly five times as large as the ones formerly occupied.

The Paramount company specializes in welded aluminum gasoline and oil tanks for airplanes. It also does general sheet metal work in all materials and some of its other products are pontoons, cowls, etc. Its clients include some of the leading aircraft manufacturers.

REVIEWS

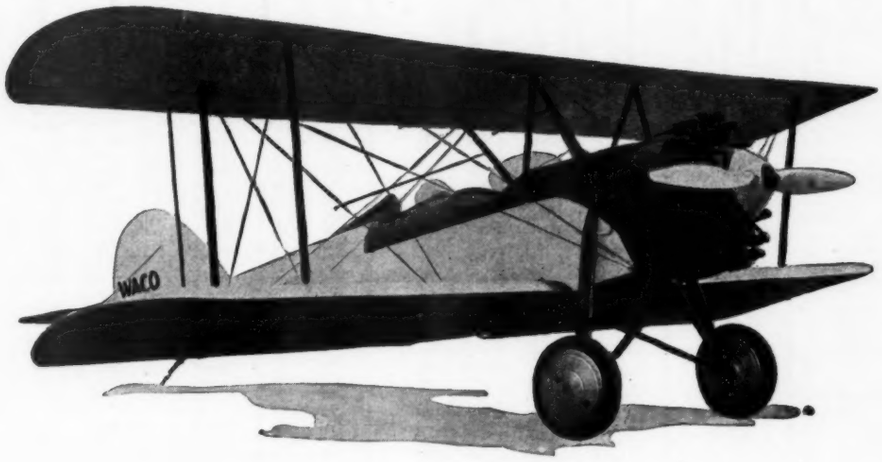
The Book Department, Aviation, 250 West 57th St., New York City can supply all books mentioned except government publications. N.A.C.A. publications may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

N.A.C.A. Report No. 283. A Preliminary Investigation of Supercharging an Air Cooled Engine in Flight. By Marsden Ware and Oscar W. Schey.

The report presents results of tests made by the N.A.C.A. in a preliminary investigation of the effects of supercharging an air cooled engine under airplane flight conditions. Service training airplanes were used in the investigation equipped with production types of Wright J engines, using an N.A.C.A. Roots type supercharger driven from the rear of the engine.

In addition to measuring those quantities that would enable the determination of the climb performance, measurements were made of the cylinder-head temperatures and the carburetor pressures and temperatures. The supercharging equipment was not removed from the airplane when making flights without supercharging, but a by-pass valve, which controlled the amount of supercharging by returning to the atmosphere the surplus air delivered by the supercharger, was left open.

With the supercharger so geared that ground-level pressure could be maintained to 18,500 ft., it was found that the absolute ceiling was increased from 19,400 to 32,600 ft., that the time of climb to 16,000 ft. was decreased from 32 to 16 min., and that this amount of supercharging apparently did not injure the engine.



WACO TEN — WHIRLWIND

The exceptional ability to get in and out of very small fields is another reason for the profits made by WACO operators

WACO is now available with OX5, 90 H.P. Ryan-Siemens, 125 H.P. and Wright Whirlwind 200 H.P. motors.

Type Certificates 11 - 13 - 26

California: Los Angeles—Amn Aircraft Corp. *Connecticut*: Hartford—New England Aircraft Corp. *Canada*: London, Ont.—London Air Transport Ltd. *Florida*: Orlando—Nilsen—Muller Co. *Georgia*: Atlanta—Douglas Davis Flying Service. *Illinois*: Monmouth—Midwest Airways. *Indiana*: Kokomo—Clyde Shockley. *Kentucky*: Louisville—Cardinal Flyers Inc. *Louisiana*: Tallulah—Southern Dusting Co. *Michigan*: Ypsilanti—Knapp Flying Service. *Missouri*: Kansas City—Tex LaGrone. *Montana*: Great Falls—Vance Flying Service, Dillon—Montana Air Service. *New York*: New York City—N. Y. Aircraft Dist., Inc.; Buffalo—Buffalo Aircraft Dist., Inc. *Oregon*: Portland—Rankin Flying Service. *Ohio*: Cincinnati—Embry-Riddle Co., Akron—Akron Airport Inc., Youngstown—Bernard Airways Inc., Steubenville—Tri-State Flying Service. *Pennsylvania*: Philadelphia—Ludington Exhibition Co., McKeesport—Clifford Ball. *South Carolina*: Fort Mill—Elliott Springs—John Crowell. *Tennessee*: Memphis—Midsouth Airways. *Texas*: Austin—University Aerial Service. *Wisconsin*: Wausau—Northern Airways, Inc. *West Virginia*: Wheeling—W. Va. Waco Sales. *District of Columbia*: Washington—Capitol Airways, Inc. *Cuba*: Havana—Alfredo Hornedo.

WACO AIRPLANES

The Advance Aircraft Co. TROY OHIO

MANUFACTURERS' SPECIFICATIONS ON AMERICAN COM

THE TABLE BELOW IS BELIEVED TO BE ACCURATE BUT A

This table will appear

MANUFACTURER	Designation	Price of Plane at Factory	Type	No. of Seats	Make of Engine	Total Rated HP.	Make of Propeller	Span	Wing Area (Sq. Ft.)	Length Overall	Height Overall	Weight Empty (Lb.) With Water if Water Cooled Engine Is Used	Pay Load (Lbs.)	Disposable Load (Lbs.)	Cruising Speed in M.P.H.	Landing Speed in M. P. H.
Advance Aircraft Co.	Waco 10	$2035*	OBL	3	R59	125	.....	30′ 9″	272	23′ 3″	9′ 5″	....	....	....	..	..
Advance Aircraft Co.	Waco 10	$2035*	OBL	3	OX5	90	H,Hs	30′ 8″	272	23′ 3″	9′ 5″	1200	760	[illegible]	95	35
Aero-Craft Mfg. Co.	Aero-Coupe	.....	SBL	3	W	110	.....	32′	250	24′	8″ 6′	1100	550	1650	100	34
Alexander Aircraft Corp.	Eaglerock	$2,250*	OBL	3	OX5	90	.....	36′ 8″	330	24′ 11″	9′ 11″	....	....	....	87	34
Alexander Aircraft Corp.	Eaglerock	$2,250*	OBL	3	R59	125	.....	36′ 8″	330	24′ 11″	9′ 11″	....	....	....	85	34
American Eagle Aircraft Co.	.....	$2885	OBL	3	OX5	90	H, Hs	30′	300	24′ 6″	8′ 4″	1227	840	[illegible]	85	30
Arkansas Aircraft Corp.	Comm'd-Aire	.....	OBL	3	OX5	90	.....	31′ 6″	300	24′ 6″	8′	1275	....	[illegible]	..	36
Arkansas Aircraft Corp.	Heinkel H.D. 40	.....	CBL	2	PWw	400	.....	57′	250	39′	14′	....	2500	[illegible]	..	54
Atlantic Aircraft Corp.	F-7 & C-3	$44,500	CML	10-12	3-J5	600	H	63′ 3″	630	49′ 2″	12′ 9″	5480	2000	[illegible]	100	55
Atlantic Aircraft Corp.	Universal	$14,200	CML	5-7	J-5	200	H, Hs	47′ 9″	341	33′	8′ 9″	2100	1200	[illegible]	98	48
Atlantic Aircraft Corp.	Super-Univ.	$19,340	CML	6-8	P Ww	400	SS	50′ 6″	382	36″	8′ 11″	2800	1230	[illegible]	118	42
Atlantic Aircraft Corp.	Fokker F-10	$60,000	CML	14	3-PWw	600	SS	71′2″	728	50′ 8″	12′ 5″	7200	2640	[illegible]	123	55
Bach Aircraft Co.	Air Yacht	.....	CML	9	2-K J5	400	.....	52′	412	36.1	....	2650	....	....	100	45
Bellanca Aircraft Corp.	CH	$14,500	CML	6	J5	200	Hs	46′ 1″	273	24′ 9′	8′ 6	1850	1100	[illegible]	110	46
Berliner Aircraft Co.	.....	.....	OML	3	J5	200	SS	34″	206	25′	8′	1400	....	....	110	44
Bird Wing Commr. Airplane Co.	No. 6	$2,450	OBL	3	OX5	90	Hs	31′ 4″	303	23′ 6″	8′ 7	1267	500	[illegible]	80	30
Boeing Airplane Co.	40A	.....	SBL	1-5	P Ww	400	H, M	44′ 2″	545	34′3″	11′ 7″	3031	1600	[illegible]	..	54
Breese Aircraft Co.	.....	.....	CML	6	J5	200	SS	41′	260	41′	10′ 6″	155	..	[illegible]	115	43
Brown-Mercury Aircraft Corp.	C-3	$9,800	CML	3	3-A6	180	Sty	41′ 6″	260	25′	.....	1450	600	[illegible]	100	40
Buhl Aircraft Co.	Airsedan-C5A	$12,500	CBL	5	J5	200	SS	42′	320	28	14′	2072	1000	[illegible]	95	50
Buhl Aircraft Co.	Airster	$10,000	OBL	3	J5	200	SS	35′ 8″	309	23′ 2″	9′ 7″	1575	800	[illegible]	100	45
Cessna Aircraft Co.	3-120	3,575*	CML	3	A	120	H, Hs	40′ 6″	224	23′ 8′	7 4	1250	480	[illegible]	110	45
Cessna Aircraft Co.	4-125	4,075*	CML	4	RS9	125	H, Hs	40′ 6″	224	23′ 8	7 4	1260	760	[illegible]	115	45
Cessna Aircraft Co.	4-200	4,475*	CML	4	J5	200	H Hs	40′ 6″	224	23′ 8	7 4′	1350	800	[illegible]	125	45
Crawford M. & A Mfg. Co.	A1	$1,500	OML	2	LR	80	own	30′	150	17′ 9″	8′	950	....	[illegible]	64	47
Curtiss-Robertson A'p'ne Mfg. Co.	Robin	.....	CML	3	OX5	90	CR	41′	265	25′ 9″	7′ 10″	1400	....	[illegible]	85	40
Driggs Aircraft Corp.	Dart II	$1,750	OBL	2	A3	35	Hs	28′	140	19′ 6″	6′	380	....	[illegible]	75	35
G. Elias & Bros.	M-1	$7,500	OBL	1	L12	400	CR	40′	497	28′	12	2857	1200	[illegible]	105	45
G. Elias & Bros.	Airmobile	$7,500	OBL	3	L12	400	CR	40′	435	28′	11′ 3″	2759	420	[illegible]	125	45
Fairchild Airplane Mfg. Co.	FC-2W	.....	CML	5	P Ww	400	SS	50′	332	30′ 11″	9′	2570	970	[illegible]	120	55
Fairchild Airplane Mfg. Co.	FC-2W sea	.....	CMW	5	P Ww	400	SS	50′	332	33′ 4″	12′	2418	1130	[illegible]	110	58
Fairchild Airplane Mfg. Co.	FC-2 land	.....	CML	5	J5	200	CR	44′	290	30′ 11″	9′	2150	845	[illegible]	103	53
Fairchild Airplane Mfg. Co.	FC-2 sea	.....	CMW	5	J5	200	CR	44′	290	32′5″	11′ 5″	2427	833	[illegible]	..	53
Federal Aircraft Corp.	CM-1	$12,500	CM	5	J4B	200	We	37′ 6″	262	29′ 3″	9′	2080	630	[illegible]	105	40
Gillis Aircraft Corp.	Crusader	.....	CBL	4	RS9	125	Hm	32′9	245	23′	9′	....	....	....	90	45
Hamilton Metalplane Co.	H-19	.....	CML	6	J5	200	H	48′	287	32′ 7″	8′ 10″	1960	....	[illegible]	100	50
Hamilton Metalplane Co.	H-21	.....	CML	6	PWw	400	H	54′	392	33′ 7″	9′ 6″	2485	....	[illegible]	115	55
Heath Airplane Co.	Parasol	$695	OML	1	H	23	own	23′	94	16′9″	5′ 11″	290	....	[illegible]	65	32
International Aircraft Corp.	F-17	$2,750*	OBL	3	OX5	90	H	35′	325	25	9′ 6″	1300	400	[illegible]	87	35
International Aircraft Corp.	F-17	$2,900*	OBL	4	J5	200	SS	35′	325	25	.....	1350	400	[illegible]	120	35
International Aircraft Corp.	F-18	$2,250*	OBL	7	J5	200	SS	37′	360	27′ 6″	10′ 6″	1550	1000	[illegible]	110	40
Ireland Aircraft, Inc.	Neptune	$14,600	CMA	5	J5	200	CR	40	350	31′ 6″	11′ 6″	2250	750	[illegible]	95	46
Irwin Aircraft Co.	M-T-2	$1,165	OBL	1	179	25	own	20′	105	13′ 6″	5′ 9″	250	100	[illegible]	75	28
Keystone Aircraft Corp.	Pronto	.....	OBL	3	J5	200	.....	39′ 11″	365	26′ 9″	.....	1975	....	[illegible]	..	..
Keystone Aircraft Corp.	Pathfinder	.....	CBL	13	3-J5	600	.....	66′ 6″	1150	40′ 4″	.....	6536	1900	[illegible]	..	57
Kinner A. & M. Corp.	Airster	$3,350	OBL	2-3	K5	100	S	28′ 6″	236	21′ 3″	8′ 5″	850	330	[illegible]	90	35
Kreider-Reisner Aircraft, Inc.	Challenger	.....	OBL	3	OX5	90	Hs, H	30′ 1″	296	23′ 9″	9′ 4″	1189	412	[illegible]	..	39
E. M. Laird Airplane Co.	Commercial	.....	OBL	3	J5	200	SS	34′	300	23′ 6″	9′ 3″	1550	800	....	10	40
Laird Aircraft Corp.	Whippoorwi	.....	CBL	4	J-5	200	.....	36′	351	27	9	1650	....	[illegible]	105	40
Lincoln Aircraft Co.	L'ncln-Page	.....	OBL	3	OX5	90	.....	32′	300	.....	.....	1200	450	[illegible]	..	35
Lockheed Aircraft Co.	Vega		CML	5-7	J5	200	SS We	41′	275	27′5″	8′ 6″	1650	1000	[illegible]	110	50
Lockheed Aircraft Co.	Air Exp.		CML	5-7	P Ww	400	SS	41′	275	27′ 6″	8′ 6″	1850	1000	[illegible]	135	55
Loening Aeronautical Engr. Corp.	Cabin Amphibian	$24,700	CBA	5-7	PWw	400	SS	45′	504	34′8″	13′2″	3400	1200	[illegible]	..	50
B.F. Mahoney Aircraft Corp.	Ryan B1	$12,200	CML	5	J5	200	H W	42′	290	27′ 5″	9′ 10″	1870	800	[illegible]	108	49
Metal Aircraft Co.	Flamingo GMT6	.....	CML	6-8	PWw	400	SS	48′	354′	30′	9′	2800	....	[illegible]	120	48
Mohawk Aircraft Corp.	Pinto	$2,675	OML	2	V	70	Hs	30′ 6″	124	22′	6′3″	725	....	[illegible]	90	35
Mono Aircraft Inc.	Monocoupe	$2,375	CML	2	A	60	.....	30′	150	20	6′ 3′	700	....	[illegible]	87	35
National Airways System, Inc.	Air King	$2,395	OBL	3	OX5	90	Hs	34′ 1″	310	25′ 5	9′	1290	....	[illegible]	85	35
Niles Aircraft Co.	Williams	.....	OML	1	Sa	40	.....	26′	108	18	6′6″	440	....	[illegible]	..	30
Pheasant Aircraft Co., Inc.	H-10	$2,375	OBL	3	OX5	90	Hs	32′ 6″	283	23′ 6″	9′	1297	600	[illegible]	90	35
Pitcairn Aviation, Inc.	Mailwing	$10,000	OBL	1-3	J5	200	SS	33′	252	22′ 10″	8′ 10″	1612	600	[illegible]	105	45
Pitcairn Aviation, Inc.	PA-4	.....	OBL	3	OX5	90	Hs	30′	226	21′ 10″	8′7″	1165	....	[illegible]	83	45
Prudden-San Diego Airplane Co.	T-M-1	.....	CML	7	3-RS9	375	Wd	57′	427	38′	9′ 5″	3000	1200	[illegible]	95	52
Richmond Airways, Inc.	Sea Hawk	.....	OMF	5	C6	160	.....	46′	317	28′	.....	1700	....	[illegible]	..	45
Sikorsky Mfg. Co.	S-38	.....	OBA	8	2-J5	400	.....	72′	668	34″	12′	4600	....	[illegible]	100	51
Sikorsky Mfg. Co.	S-37	.....	CBL	18	2P Wh	1000	.....	100′	1049	45′ 6″	16′ 3″	8000	4060	[illegible]	112	58
Simplex Aircraft Corp.	Red Arrow	$3,950	CML	2	K5	100	Sty	33′ 4″	148	20′ 3″	6′ 10″	1000	....	[illegible]	110	40
Stearman Aircraft Co.	C-2-K	$6,740	OBL	3	RS9	125	H, Hs	35′-28′	296	24′	9′	1285	350	[illegible]	90	38
Stearman Aircraft Co.	C-2-B	$8,730	OBL	3	J5	200	H, CR	35′-28′	296	23	9′	1438	400	[illegible]	110	41
Stinson Aircraft Corp.	SB-1	$11,000	CBL	5	J5	200	SS	35′ 10″	354	28′ 10″	10′ 3″	1815	....	[illegible]	100	46
Stinson Aircraft Corp.	SM-1	$12,500	CML	6	J5	200	SS	45′ 10″	292	32′	9′	1970	....	[illegible]	105	55
Stinson Aircraft Corp.	Junior	.....	CML	3	W	110	Wd	39′ 6″	228	26′ 1″	7′9″	1450	525	[illegible]	95	45
Spartan Aircraft Co.	C-3	.....	OBL	3	RS9	125	.....	32′		23′ 6″	8′ 9″	1140	....	[illegible]	..	37
Steut Metal Airplane Co.	4 AT	.....	CML	12	3J5	600	SS	74′	785	49′ 10″	12′ 8″	6200	....	[illegible]	100	59
Swallow Airplane Mfg. Co.	Commercial	.....	OBL	3	OX5	90	.....	32′	300	24′	8′ 6″	1470	380	[illegible]	..	35
Texas Aero Corp.	Temple	.....	OML		J5	200	.....	39′ 4″	225	25′ 10″	8′ 3″	....	567	[illegible]	..	..
Thaden Metal Aircraft Co.	T-1	.....	CML	7	P Ww	400	.....	53	....	35	11	2900	....	[illegible]	..	..
Thunderbird Aircraft, Inc.	.....	.....	OBL	3	OX5	90	CR	33	300	25′ 6″	.....	1300	....	[illegible]	95	32
Travel Air Mfg. Co.	2000	$2,950	OBL		OX5	90	H, Hs	34′ 8″	296	24′ 2″	8′ 9″	1350	350	[illegible]	..	40
Travel Air Mfg. Co.	4000	$9,100	OBL	3	J5	90	H	34′ 8″	296	23′ 6″	8′ 9″	1400	600	[illegible]	..	45
Travel Air Mfg. Co.	6000	.....	CML	5	J5	200	SS, H	48′ 7″	282	30′ 6″	9′	2350	1000	[illegible]	08	57
Travel Air Mfg. Co.	Caminez	.....	OBL	3	FC	135	HH, s	34′ 8″	296	24′2″	8′9″	1275	400	[illegible]	..	37
Travel Air Mfg. Co.	9000	.....	OBL	3	RS9	125	W	34′8″	296	24′2″	8′9″	1250	360	[illegible]	..	42
Wallace Aircraft Co.	Touroplane	$2,500*	CML	3	A	80	Hs	37′	205	23′ 6″	7′ 6″	850	320	[illegible]	82	40
Whites Aircraft	Hum. Bird	$2,150	OBL	3	OX5	90	Hs	33′ 1″	318	23′ 6″	8′ 3″	1050	450	[illegible]	90	35
Western Airplane Corp.	King Bird	$2,500	OBL	3	OX5	90	Hs	35′	320	25′ 4″	9′	1200	600	[illegible]	85	30
Zenith Aircraft Corp.	Albatross	$35,000	CML	14	3-RS9	375	Sty.	90′	1032	50′	12′ 6″	4000	5000	[illegible]	85	35

TYPE:

A—Amphibian
B—Biplane
C—Closed
F—Flying boat
L—Landplane
M—Monoplan.
O—Open
S—Semi-closed
W—Seaplane

ENGINE: One engine unless stated in italics.

A—Anzani
C6—Curtiss
FC—Fairchild Caminez
H—Henderson
I79—Irwin
J5—Wright Whirlwind
K—Kinner
L—Liberty
LR—LRheone
OX5—Curtiss
P Wh—Pratt & Whitney Hornet
P Ww—Pratt & Whitney Wasp
RS—Ryan Siemens
SR—Super Rhone
Sa—Saekely
V—Velie
W—Warner
*—Price without engine

PROPELLER:

CR—Curtiss Reed
H.—Hamilton
Hs—Hartsell
M—Metal
Sty—Story
SS—Standard Steel
W—Wood
We—Westinghouse

L AIRPLANES AND SEAPLANES AS COMPILED BY *AVIATION*

ES NOT ASSUME RESPONSIBILITY FOR THE FIGURES GIVEN

and suggestions are invited.

Performance With Full Load at Sea Level As Supplied by Manufacturers.					Fuel Capacity in Gallons	Normal Range in Miles	Normal Fuel Consumption at Cruising Speed* Gal. Per Hr.	Fuselage Construction	Wing Construction	Are Wings Wired for Lighting?	Type of Control	Brakes	Type of Shock Absorber	Type of Pontoon Provided for	Additional Cost as Seaplane	Dept. of Commerce Type Certificate Number	Performance Figure Guaranteed?	
Cruising Speed in M.P.H.	Landing Speed in M. P. H.	Climb at Sea Level in F. P. M.	Climb to 10,000 in Minutes	Service Ceiling in Feet														
..	..	..	..	....	37	..	....	Wl-ST	Wd-F	No	SPD	Ex.	H	EFH	$1,100	26	....	Advance—Waco 10
95	35	750	29	12,000	37	550	7.5	Wl-ST	Wd-F	No	SPD	Ex.	H	EFH	$1,100	13	No.	Advance—Waco 10
100		900			46	460		Wl-ST	Wd-F	Yes	SD							Aero-Craft—Coupe
87	34	514	..	10,200	46	435	10.3	Wl-ST	Wd-F	....	SCD	....	RC	E	....	7	....	Alexander—Eaglerock
85	34	830	..	14,780	46	425	10	Wl-ST	Wd-F	$20	SCD	....	RC	E	....	..	Yes	Alexander—Eaglerock
85	30	575	45	12,000	42	425	7.5	Wl-ST	Wd-F	No	SPD	Ex.	R	E	$990	17	....	American Eagle
..	36	..	..	....	..	400	....	Wl-ST	Wd-F	....	S	....	RC	....	....	..	....	Arkansas Aircraft Co.
..	54	..	..	....	..	..	....	Wl-ST	Wd-F	....	DeD	....	....	....	....	..	5% N	Arkansas—Heinkel H.D. 40
100	55	720	24	12,500	185	580	32	Wl-ST	Wd-P	Yes	DeCD	Yes	RC	....	....	Apl	....	Atlantic—Fokker F7 & C-2
98	48	500	40	11,500	78	600	12	Wl-ST	Wd-P	Yes	SCD	Yes	RC	Met.	$2450	9	....	Atlantic—Fokker Univ.
118	42	1000	15	18,000	120	700	20	Wl-ST	Wd-P	Yes	SCD	Yes	RC	Met.	$3110	Apl	5%	Atlantic—Super Univ.
123	55	1420	10	18,000	286	580	60	Wl-ST	Wd-P	Yes	DeCD	Yes	RC	....	....	..	....	Atlantic—Fokker F-10
..	..	..	..	....	150	..	....	.....	.....	....	....	....	O	....	....	..	....	Bach—Air Yacht
100	45	..	..	....	85	800	10	Wl-ST	Wd-F	Yes	SCD	....	RC	D	....	..	....	Bellanca CH
110	46	850	..	13,000	44	450	10	Wl-ST	Wd-F	....	D	Yes	....	....	....	..	....	Berliner
110	44	..	..	....	44	450	10	Wl-ST	Wd-F	....	D	Yes	....	....	....	..	....	Bird Wing—No. 6
80	30	450	85	10,000	35	325	9	Wl-ST	Wd-F	Yes	SC PD	Ex.	RC	E	$900	Apl	Yes	Boeing 40A
..	54	770	19	15,000	100	..	....	Wl-ST	Wd-F	Yes	S	Yes	O	....	....	2	....	Breese
115	43	900	..	15,500	80	550	9.5	Wl-ST	Wd-F	....	....	....	RC	....	....	..	....	Brown-Mercury—C-3
100	40	600	35	14,000	78	650	12	Wl-ST	Wd-F	Yes	SC	....	Grs.	No	....	Apl	Yes	Buhl Airsedan
95	50	700	45	13,500	70	..	15	Wl-ST	Wd-F	Yes	SC	Yes	RD	Met.	$2,500	33		Buhl Airster
100	45	1150	10	18,000	64	500	12	Wl-ST	Wd-F	Yes	S	Yes	RD	Met.	$2,500	1	Yes	Cessna Aircraft Co.
110	45	1000	..	....	42	400	10	Wl-ST	Wd-PF	Ex.	SPD	Ex.	RC	....	....	Apl	5%	Cessna Aircraft Co.
115	45	1000	..	....	42	400	10	Wl-ST	Wd-PF	Ex.	SPD	Ex.	RC	....	....	Apl	5%	Cessna Aircraft Co.
125	45	1400	..	....	42	400	12	Wl-ST	Wd-PF	Ex.	SPD	Ex.	RC	....	....	Apl	5%	Crawford A/
64	47	..	..	18,000	40	500	6	ST-Wd	Wd-F	No	D	....	RC	....	....	No		Curtiss—Robin
85	40	500	..	11,000	50	785	....	Wl-ST	Wd-F	....	SD	....	RC	....	....	..	....	
75	35	1660	10	15,000	10	225	....	Wl-ST	Wd-FD	No	....	No	RC	None	....	15	....	Driggs Aircraft Corp.
105	45	1250	19	15,000	100	525	20	Wl-ST D	Wd-F	Yes	C	No	TR	....	....	No	....	G. Elias & Bros.—MF
125	45	1050	10	16,000	100	625	20	Wl-ST	Wd-F	Yes	SC	No	RC	....	....	..	....	Elias—Airmobile
120	55	580	12	18,000	160	1050	18	Wl-ST	Wd-F	Yes	S-CP	Yes	Hy	F	....	20	....	Fairchild—FC-2W land
110	58	420	21	12,000	160	950	18	Wl-ST	Wd-F	Yes	S-CP	....	....	F	....	20	....	Fairchild—FC-2W sea
103	53	580	27	13,100	110	710	15.5	Wl-ST	Wd-F	Yes	S-CP	Yes	Hy	F	....	10	....	Fairchild—FC- land
..	53	1250	36	12,700	110	650	15.5	Wl-ST	Wd-F	Yes	S-CP	....	....	F	....	10	....	Fairchild—FC-2 sea
105	40	..	..	....	84	750	10	Wl-ST	Wd-ST	Yes	SC	Yes	Arl	....	....	..	....	Federal Aircraft—CM-1
90	45	600	..	11,500	45	420	....	Wl-ST	Wd-F	Yes	DeD	B	O	....	....	..	....	Gillis—Crusader
100	50	750	..	....	100	..	12	D-cor.	D-cor.	....	PD	....	O	H	....	..	Yes	Hamilton—H-19
115	55	100	..	....	140	..	21	D-cor.	D-cor.	....	PD	....	O	H	....	..	Yes	Hamilton—H-21
65	32	200	..	....	3.3	120	....	R-ST	Wd-F	No	SC	No	RC	....	....	..	....	Heath—Parasol
87	35	600	..	10,500	40	450	....	Wd	.....	....	S	Ex.	O	....	....	35	5%	International—F-17
120	35	1000	..	16,000	66	700	....	Wd	Wd-F	....	S	Ex.	O	....	....	Apl	5%	International—F-17
110	40	800	..	15,000	106	1000	....	Wd	Wd-F	....	S	Ex.	O	....	....	Apl	5%	International—F-18
85	46	650	35	11,000	65	500	12	ST-D	Wd-F	Yes	DeD	No	O	....	....	Apl	5%	Ireland—Neptune
75	28	400	65	12,000	8	300	1.7	Wd	Wd-F	Yes	SC	....	RC	W	$175	..	6%	Irwin—M-T-2
..	..	800	..	14,000	60	..	....	Wl-ST	Wd-F	....	....	....	....	....	....	..	....	Keystone—Pronto
..	57	570	..	....	..	500	....	Wl-ST	Wd-F	....	....	....	....	....	....	..	....	Keystone—Pathfinder
90	35	750	45	14,000	27	400	6	Wd	Wd-F	No	SD	No	Grs.	....	....	Apl	Yes	Kinner—Airster
..	39	548	..	12,000	..	400	....	Wl-ST	Wd-F	Ex.	SD	No	RC	EH	$1,000	19	5% N	Kreider-Reisner—Challenger
10	40	1350	10	....	80	600	....	DT, S	Wd-F	....	SPA	....	....	....	....	..	....	E. M. Laird—Commercia
105	40	..	15	....	..	..	....	Wl-ST	Wd-F	Yes	DeD.	Std	RC	....	....	..	....	Laird—Whippoorwill
..	35	600	..	....	42	500	....	Wl-ST	Wd-F	....	....	....	....	....	....	28	....	Lincoln—Page
110	50	1000	16	15,900	100	700	10	W-mon.	Wd-P	Yes	SC	H	RHy	E	....	Apl	5%	Lockheed—Vega
135	55	1460	10	17,250	100	1000	18	W-mon.	Wd-P	Yes	SC	H	RHy	....	....	Apl	5%	Lockheed—Air Express
..	50	..	..	14,000	140	650	....	Wd-D	Wd-F	Yes	DeC	Ex.	RC	....	....	34	....	Loening—Amphibian
108	49	1000	..	16,000	83	700	10-11	Wl-ST	Wd-F	....	SC	S	Grs	E	....	25	Yes	B. F. Mahoney—Ryan B/
120	48	1375	..	....	150	1000	18	Wl-ST D	D	Yes	DeDC	S	Arl	....	....	..	....	Metal—Flamingo
90	35	800	..	12,000	..	360	20	Wl-ST	Wd-F	Yes	S	Std.	Arl	....	....	..	....	Mohawk—Pinto
87	35	700	35	....	25	4 0	4	Wl-ST	Wd-F	Yes	SP	....	RC	....	....	22	Yes	Mono Aircraft—Monocoupe
85	35	600	..	15,000	35	396	8	Wl-ST	Wd-F	No	S	No	RC	....	....	29	....	National Airways—Air King
..	30	925	..	....	..	360	....	Wl-ST	Wd-F	....	SC	Std	....	....	....	Apl	....	Niles—Williams
90	35	500	25	12,500	38	400	9	Wl-ST	Wd-F	Ex.	SPD	Ex.	RC	EH	$1,000	36	....	Pheasant—H/0
105	45	1600	..	11,000	60	600	....	Wl-ST	Wd-F	Yes	S	Yes	Arl	....	$900	18	5%	Pitcairn—Mailwing
82	45	..	..	....	35	400	....	Wl-ST	Wd-F	....	S	....	Grs	....	....	..	Yes	Pitcairn—PA-4
95	52	500	25	11,000	110	400	21	D-cor.	D-cor.	....	....	B	Grs.	....	....	..	....	Prudden-San Diego
..	45	..	..	....	42	..	....	WD	Wd-F	....	DeCP	....	....	....	....	..	....	Richmond Airways—Sea Hawk
100	51	400	..	11,000	326	1000	25	Wd-D	DOR, B	....	De D	....	RDO	....	....	..	5%	Sikorsky—S36
112	58	650	..	15,000	370	790	50	DOR, B	DOR, B	....	De D	Hy	RDO	....	....	Apl	5%	Sikorsky—S37
110	40	1000	17	16,000	..	1250	5.5	Wl-ST	Wd-F	Yes	S	....	....	....	....	..	5%	Simplex Aircraft Corp.
90	38	625	..	12,000	50	500	7	Wl-ST	Wd-F	Yes	PC	St.	RHy	D	....	Apl	5%	Stearman—C-2-K
110	41	1000	..	18,000	65	620	11.5	Wl-ST	Wd-F	Yes	PC	St.	RHy	D	$1,200	Apl	5%	Stearman—C-2-B
100	46	600	..	13,500	70	600	11.5	Wl-ST	Wd-F	Yes	DeD	St.	....	M	$2,500	24	5%	Stinson—SB-1
105	55	750	..	14,000	90	700	11 5	Wl-ST	Wd-F	Yes	DeD	St.	RC	M	$2,500	16	5%	Stinson—SM-1
95	45	..	..	....	40	600	....	Wl-ST	Wd-F	Yes	D	Yes	Hy	....	....	..	....	Stinson—Junior
..	37	100	..	....	44	600	....	Wl-ST	Wd-F	....	S	....	RC	....	....	..	....	Spartan Aircraft Co.
100	59	..	..	14,000	235	540	9	D-cor.	D-cor.	Yes	DeD	St	O	....	....	..	....	Stout—Ford—4AT
..	35	600	..	....	36	500		Wl-ST	Wd-F	....	....	....	RC	....	....	21	....	Swallow—Commercial
..	..	..	..	....	50	..	....	Wl-ST	Wd-F	....	S	....	....	....	....	..	....	Texas Aero Corp.
95	32	..	..	....	120	..	....	D-cor.	D-cor.	....	De	....	Grs.	....	....	..	....	Thaden Metal Aircraft Co.
..	..	..	..	15,000	43	..	....	Wl-ST	Wd-F	....	S	....	....	....	....	..	....	Thunderbird
..	40	..	..	....	42	410	8	Wl-ST	Wd-F	Yes	SPC	No	RC	....	....	30	....	Travel Air—2000
..	45	..	..	....	60	..	12	Wl-ST	Wd-F	Yes	SPC	No	RC	....	....	32	....	Travel—4000
98	57	750	..	15,000	78	700	12	Wl-ST	Wd-F	Yes	DeD	Yes	O	....	....	..	....	Travel Air—6000
..	37	..	..	....	42	475	....	Wl-ST	Wd-F	Yes	SPC	....	RC	....	....	37	....	Travel Air—Caminez
..	42	..	..	....	60	650	....	Wl-ST	Wd-F	Yes	SPC	....	RC	....	....	38	....	Travel Air—Siemens
82	40	670	37	11,000	28	500	5 25	Wl-ST	Wd-F	Yes	SPD	....	Hy	....	....	..	....	Wallace—Touroplane
90	35	600	..	14,000	40	350	8	Wd WIS	Wd-F	No	S	....	C	E	....	Apl	5%	Whites—Humming Bird
85	30	600	20	12,000	..	500	8	Wl-ST	Wd-F	No	SC D	No	RC	Own	$1,000	No	5%	Western—King Bird
85	35	600	..	20,000	300	1000	20	Wl-ST	Wd-F	Yes	C	Yes	Arl	No	....	..	Yes	Zenith—Albatross

ELAGE AND WING CONSTRUCTION:
ted
Corrugated
uralumin
ric cover
Monocoque
en section
AKES:
ndix
tura
ydraulic

P—Plywood cover
R—Riveted
S—Steel
T—Tubing
Wd—Wood
Wl—Welded

L—Lockheed
S—Sauzedde
Std—Standard

LIGHTS:
N—Navigation lights

CONTROL:
A—Arens
C—Cables
D—Dual
De—Wheel
P—Push rods
S—Stick

SHOCK ABSORBER:
Arl—Aerol
C—Chord
D—Compression
Grs—Gruss
Hy—Hydraulic
O—Oleo
R—Rubber
T—Trombone

GUARANTEE:
N—New

PONTOONS:
D—Duralumin
E—Edo
F—Fairchild
H—Hamilton
M—All metal
W—Wood

TYPE CERTIFICATE:
Apl—Applied for and is pending

Fuselage Analysis

Continued from page 1455

tail. There are seven conditions for which the fuselage must be analyzed. These are; high incidence, low incidence, maximum stabilizer and elevator load, maximum fin and rudder load, level landing, three-point landing, and nosing over. The entire fuselage structure need not be analyzed for all these conditions. Experience and judgment will indicate which condition will impose the severest loads on a certain portion of the fuselage. For example, the maximum tail loadings need only to be investigated as far forward as the rear of lift truss. Some additional stress investigations are also needed for members carrying eccentric or bending loads in addition to the loads obtained in them in the analysis for the fuselage conditions.

High Incidence Condition—In this condition, the fuselage is assumed to be subject to the following loads:

a. Weight of fuselage and contents multiplied by the high incidence load factor. These forces are assumed to act normal to the propeller axis.

b. The high incidence wing reactions multiplied by the factor required for equilibrium.

c. A load on the nose of the fuselage, acting along the propeller axis, and of the magnitude required by the conditions of equilibrium. This load may be considered to represent the resultant of the propeller thrust, drag of the fuselage, and the components of the weight and inertia forces of the fuselage and contents parallel to the propeller axis.

d. An arbitrary load at the tail post, acting normal to the propeller axis, of the magnitude and acting up or down as required for equilibrium.

Low Incidence Condition—The analysis for this condition is almost exactly similar to that for high incidence. The loads are applied in the following manner:

a. Weight of fuselage and contents multiplied by the low incidence load factor. These weights are assumed to act normal to the propeller axis.

b. A load at the tail post, or on the horizontal tail surfaces perpendicular to the propeller axis, and of the magnitudes required to obtain equilibrium.

c. Loads from the wings equal to the forces supporting the wings in the low incidence condition multiplied by a factor sufficient to make the sum of the forces perpendicular to the propeller axis equal to zero.

d. A load along the propeller axis sufficient to make the sum of forces parallel to that axis equal to zero. This load is placed at the nose of the fuselage.

The loads and factors under b, c, and d of both high and low incidence must be obtained by applying the equations of equilibrium to the entire structure. This will be done later for our plane in the high incidence condition and the method employed illustrated. For various reasons the wing reactions on the fuselage do not exactly balance the weights and inertia forces of the fuselage. They are therefore increased by a factor K to obtain equilibrium. Before the analysis of the fuselage trussing can begin the entire system must be in static equilibrium—which means summation V, summation H, and summation Moments, all equal to zero. This is especially true if we are to solve the truss graphically else our diagram will not close. The analysis will be made graphically for high incidence in detail later in the chapter.

Maximum Stabilizer and Elevator Load—The fuselage is to be analyzed for a load on the tail of the magnitude specified in Table 17. This load on the tail is assumed to act down. For planes without tail skids such as seaplanes the fuselage must also be investigated for an up load on the tail. The investigations for these conditions need not be carried further forward than the rear of the lift truss.

Maximum Fin and Rudder Load—The fuselage must be analyzed for maximum loads on the vertical tail surfaces as specified in Table 17. These loads must be assumed to act either way. In analyzing for this condition proper allowance must be made for the torsion due to the fact that the center of pressure on the vertical surfaces is above the fuselage, which is the case in nearly all present day planes. The usual method of taking care of this torsion is to apply a load greater than the tail load on the upper truss and a load in the opposite direction on the lower, the resultant of these two loads being equal to the load on the tail. This will be illustrated later for our plane. This condition usually determines the top and bottom truss members of the fuselage. Where bays are left open for cockpits proper provision must be made for carrying through the loads such as gusseting the corners. Where the top and bottom stresses are similar it will usually be found easier and safer to analyze only the top truss for its load and assume that the similar members of the bottom truss carry the same load. This is safe because by our method of caring for the torsion we have applied a much greater load on the top truss than on the bottom.

Level Landing Condition—The fuselage is assumed to be subject to the following loads:

a. Weight of the airplane, except the chassis, assumed to act normal to the propeller axis.

b. The landing gear reactions from the level landing chassis analysis. The vertical components of these reactions should balance the weights.

c. Horizontal forces loads representing the inertia forces due to slowing down of the airplane. If desired the panel loads of the fuselage weights may be assumed to act parallel to the resultant of the landing gear reaction. In this case the reaction should balance the sum of the loads. Summation moments must also be zero, of course, before the system is in equilibrium and can be analyzed. Due to the position of the center of gravity shifting with and without landing gear and slight inaccuracies in placing loads at panel points etc. it will usually be found that the moments will not equal zero even though the reaction equals the sum of the panel loads. The individual reactions of the chassis struts on the fuselage should be slightly altered in this case until equilibrium is obtained.

This condition will not be critical for the rear half of the fuselage.

Three-point Landing Condition—In this condition the plane is resting on the wheels and tail skid with all shock absorber units fully deflected just as in the chassis analysis. The fuselage is assumed to be subject to the following loads:

a. Weight of the airplane excepting only such units as are carried by the landing gear without the aid of the fuselage. These loads are assumed to act perpendicular to the ground line.

b. The landing gear reaction, and tail skid load, which, as determined from the landing gear analysis should balance the weights. The entire fuselage side truss will usually have to be analyzed for this condition. As before complete equilibrium will not be obtained and slight variation of the chassis strut reactions may be needed. In analyzing the landing gear we should have used the center of gravity location without chassis included—and then our forces would balance correctly.

Nosing Over Condition—The front part of the fuselage must be designed to resist the forces to which it would be subject in nosing over unless the landing gear is of such construction that the probability of such an accident is remote. To simulate this condition the airplane is assumed to be resting on the wheels and the center of the propeller hub or that por-

tion of the primary structure of the fuselage that would strike the ground first. The gross weight of the airplane is assumed to act at the center of gravity and perpendicular to the ground. The load factor employed for this condition is the same as that for three-point landing.

Miscellaneous Conditions.

In addition to the seven foregoing conditions the fuselage structure must be investigated for several other minor conditions. These are:

1—Torque Load—The torque transmitted to the engine mount may be computed by $T = 63{,}000P/N$

where T = the torque in inch lb.

P = the horsepower of the engine

N = engine speed in r.p.m. (For geared engines N = prop speed)

For mounts with parallel engine bearers as ordinarily used for water cooled engines the torque load on each engine bearer is T/d where d is the distance in inches between the bearers. This load acts down on one engine bearer and up on the other. For radial engine mounts the torque load is equal to T/r where r is the radius of the mount ring. The usual radial mount ring has four points of attachment to the engine mount tubes. The torque load T/r is divided equally in four parts and one part applied tangent to the mount ring at each point of attachment. These forces must all be made to point in a clockwise direction. The analysis must be made through to the wing connections.

A load factor of two is required for direct-drive engines and three for geared engines. The loads found in the members for this condition are to be added to the loads found in the high incidence condition and the member designed on the sum of the two loads. The loads are to be added arithmetically and not algebraically, that is to say the sum of the two loads will always have the same sign as the high incidence load had in the first place. The reason for this is that in the torque condition the member on the other side of the fuselage from that we are dealing with will usuually have the same load but of the opposite sign.

Cabane Investigation—The cabane must be investigated for both the high and low incidence conditions assuming that 75 per cent. of the design load is acting on one wing and 60 per cent. on the other. For cabin monoplanes this investigation should be carried on for the region surrounding the cabin.

New Engine Mount for Existing Airplane—Very often one plane is designed to be adapted to several engines. The same mount will not take all the engines so several mounts must be designed. Rather than require a complete new analysis for each mount the Commerce Department has outlined an alternate procedure. The following conditions must be investigated:

1—High incidence and torque—The analysis should be made as specified for these conditions except that the reactions required may be assumed to be applied at the points where the new structure is joined to the structure of the original design.

2—Inverted Flight—The load in each member shall be assumed to be of the opposite sign to the load in that member, due to high incidence and torques, and its magnitude equal to 75 per cent. of the load. This condition shall be assumed to cover nosing over as well as inverted flight, the high ratio of reversal of load being used so this will be possible.

3—Side Load—The mount should be investigated for the weight of its contents acting sideways with an ultimate load factor equal to one-quarter of the high incidence factor.

4—In designs for which the landing load factor is greater than the high incidence factor, the landing factor must be used in place of the high incidence factor in the analysis of the high incidence and torque condition.

It must be borne in mind that the engines replacing each other in any plane must be of nearly the same power. It is usually necessary to refigure the weight and the load factors

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when a new engine is installed. The new weight times the new load factor may not be greater than the old weight times the old factor else a complete new analysis of the plane is necessary. The designer must also be careful that he has not moved his center of gravity location appreciably. Moving the center of gravity not only means a new fuselage and chassis analysis is necessary but it also will affect the entire performance of the plane.

Load Factors and Tail Surface Loads.

In the analysis of the fuselage for the flight conditions the factors used in the analysis of the wings for those conditions must be employed. For landing conditions the factor used in the chassis analysis must be used. For nosing over the landing factor is used. For the maximum tail load conditions the required load may be obtained from Table 17.

Table 17.

Class	Load per sq. ft. Ailerons and Horizontal Tail Surfaces	Load per sq. ft. Vertical Tail Surfaces
2500 lb. or less	30	22.5
5000 lb.	20	15.
12,500 lb.	15	11.25
Over 12,500 lb.	15	11.25

For our plane the factors and loadings are as follows:

High Incidence — 6.9 Low Incidence — 4.5
Level Landing — 6.5 Three-point Landing —6.5
Maximum Stabilizer and Elevator Load — 30 lb. per sq. ft.
Maximum Fin and Rudder Load — 22.5 lb. per sq. ft.
Nosing Over — 6.5

Analysis of Conventional Monoplane Fuselage.

Fig. 71 is a line diagram of the fuselage of the Conventional Monoplane that we are analyzing. The top drawing is the plan view in which we are looking down from above; the middle drawing is the side view as we ordinarily see the plane; and the bottom view is looking up from under the fuselage.

The lines of the diagrams of Fig. 71 represent the center lines of the tubes that form the fuselage structure. It is to be noted that except in one case the entire structure is built up of triangles of struts. A triangular arrangement is both rigid and determinate—that is the loads in each member can be found accurately. In the one location where there is not a triangle i.e. directly in front of the pilot where a cross strut would affect his vision—the four corners have been gusseted to make the frame rigid.

The diagonals indicated in the plan view by dot and dash lines go from the lower longeron on one side the fuselage to the upper longeron on the other side and then back to the original longeron but one bay further on. These diagonals are necessary to make the rear half of the fuselage rigid against torsional loads. They stop at the rear of the cabin as it is desirable to keep the cabin free of obstructions. However the upper and lower corners of the frames comprising the cabin must be well-gusseted to keep the structure rigid. This is easily done on small planes such as ours but on large planes it is necessary to use part of the cabin space for cross-bracing. The one frame which it has not been possible to indicate in Fig. 71 is that directly behind the engine mount and made up of members 15 and 35. This frame must be heavily gusseted or else have diagonals running across it as in this particular location the twisting of the engine is very severe and would distort an unbraced frame.

It will be noted that in the plan and bottom views the rear portions of the longerons are kept straight. Usually this portion of the longeron has comparatively small loads until the section near the cabin is reached. The load at this section gives a fairly small tube for a longeron and this size tube is usually carried right through to the tail post even though it is way over strength. If the longeron here is straight, then a great many welded joints are saved and a simple jig is all that is necessary. The flattening out of the

longeron in the last bay in the side view is to give the stabilizer a horizontal support.

The top and bottom longerons are both horizontal in the neighborhood of the cabin. At this region the wings and chassis are attached to the fuselage and if the longerons are horizontal in all three views as we have them the design of the necessary fittings is greatly simplified. It also gives a square cabin, which for a cargo or baggage carrying plane is a great advantage as all nooks and corners can be utilized and the full volume of the plane made use of.

The short dotted lines indicate the frame of the pilot's window. By this arrangement a one-piece windshield can be used. No gusseting or cross-bracing of this frame is necessary as these lines are not structural members and carry no load but the weight of the window.

The type of truss used is known as the Warren truss. For this type of plane it is the lightest and involves the fewest members. The members are numbered for future reference—namely, when the various loads under each condition for each member are listed in one chart at the completion of the fuselage analysis.

In the next chapter the fuselage weights will be distributed between panel points and the analysis of the fuselage completed for several of the conditions.

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To be continued in the next issue of AVIATION

Etching of Aluminum Alloy Propellers

Continued from page 1457

etched in 10 to 15 sec. This is not recommended, however, since small errors in time cause a large variation in the depth of etch and there is danger of over-etching.

The importance of controlling the temperature of the caustic solution is shown in Fig. 1. The depth of etch was measured by the loss in weight of standard samples from an aluminum alloy propeller. These samples were subjected to the action of 5, 10, and 20 per cent. caustic solutions for a period of 5 min. The temperature was varied from 60 to 180 deg. F. Within this temperature range an increase of 2 deg. F. is equivalent to increasing the concentration of the caustic solution 1 per cent. When the temperature is below 90 deg. F. the time required for the proper depth of etch increases very rapidly and it has been found that long etches in dilute or cold solutions of caustic soda produce an unsatisfactory etched structure. When the temperature is greater than 120 deg. F. there is danger of over-etching as noted above.

The strength of the caustic solution decreases with use, and in practice allowances should be made for this in regulating the time of etch and the temperature. It has been found that the 10 to 20 per cent. solution recommended gives very good results provided the other variables (time and temperature) are controlled. Below 90 deg. F. changes in the concentration in the above range have practically no effect upon either the depth of etch or etched structure. Between 90 and 120 deg. F. the rate of attack is about twice as great for the 20 per cent. solution as it is for the 10 per cent. solution. Fig. II shows the effect of increasing the concentration from 5 to 20 per cent. at various temperatures in the range 60 to 180 deg. F. The loss in weight shown in the graph is a measure of the depth of etch and was determined by weighing standard samples before and after immersion for five minutes in the solutions indicated.

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Immediately upon removing the propellers from the caustic solution they are plunged into water, which should be at approximately atmospheric temperature. During this operation care should be observed not to allow the caustic to dry as it affects the final appearance of the etched surface. After rinsing, the propellers are transferred to the acid bath. The

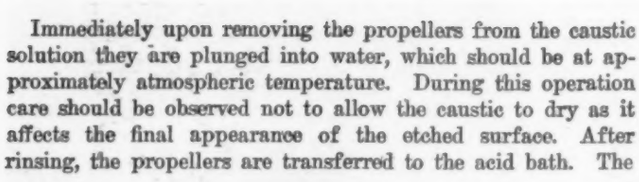


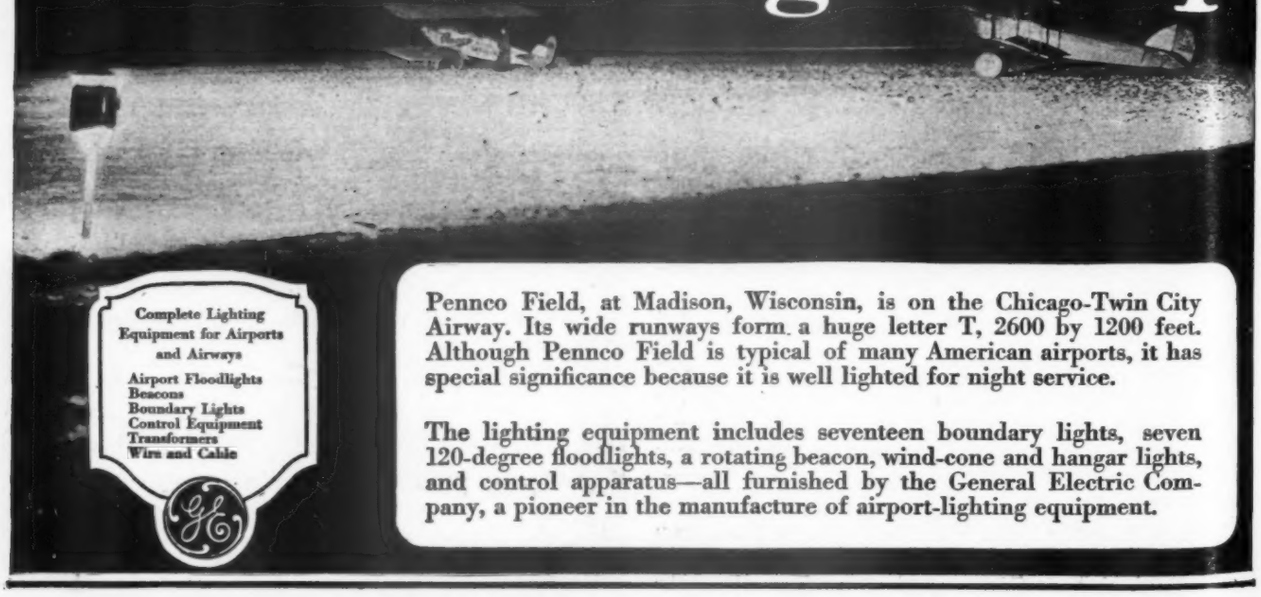
Fig. 5 (left)—Photograph of hub section of detachable-blade aluminum alloy propeller, light-etched. Arrows point to crack formed during forging. Fig. 6.—Photograph of a section of a detachable-blade propeller, light-etched. Arrows point to cracks formed during whirling test.

removal of the copper deposit may be hastened by agitation or by swabbing with a fiber brush. After all traces of the copper deposit are removed the propellers are transferred back to the same rinsing water used to remove the excess caustic. (It is desirable to use the same rinsing water for both the caustic and acid dips for the reason that the same water may be used for long periods of time due to the acid and caustic neutralizing each other; otherwise, it is necessary to change the water quite frequently). Final washing is preferably done in hot water, and for convenience the same water used for preheating the propellers may be used. After a thorough washing they are allowed to dry in either still air or in an air blast. The final appearance of the blade should be silvery white and free from all stain or tarnish.

An alternate method of etching which is applicable where only a few propellers are to be etched is as follows: After the propellers have been prepared for etching as described above, a few gallons of caustic solution are made up and applied to the surfaces rapidly and evenly with a swab or brush. For this purpose the concentration and temperature should be near the lower limits recommended for the reason that, if the action of the caustic is too rapid, it is impossible to obtain an even etch over all portions of the blade due to the time that is required to apply the caustic to the different sections. After the caustic has remained in contact with the propeller a sufficient length of time to produce the desired depth of etch, it is removed by swabbing with cold water or washing in running water. The nitric acid is then applied freely with a swab. It is important to have the rinse water and acid solution quite cold to prevent streaking and staining. The surfaces are then thoroughly washed with clean, hot or cold water, and dried.

For the inspection of the etched surface, a magnifying glass with a power of two to four diameters should be used. A reading glass may be used in the absence of a better glass. The sections adjacent to the hub and especially the bottom of the fillets and areas adjacent to bolt holes should be examined very carefully and the slightest indication of an imperfection or flaw encircled with a pencil. The areas thus marked will be rubbed with a fine grade of sandpaper or emery clot until 0.0005 to 0.002 in. of the surface metal has been removed. This operation should be followed by the

Madison Lights Up



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application of a few drops of a warm concentrated aqueous solution of caustic soda. (The solution may be prepared by filling a wide-necked bottle one-half full of hot water and adding caustic until no more dissolves). The solution may be applied to the crack or apparent defect with a small swab, glass stirring-rod, or splinter of wood. After the caustic solution has remained in contact with the metal for one or two minutes the excess caustic is wiped away with a cloth dampened with water or a weak nitric acid solution. If the crack or defect has continued beneath the surface it will show as a definite black line, and upon examination with the glass bubbles may be seen to form in the defect if it is a crack or seam. If necessary, a new application of caustic may be made and an etch of any desired depth can be made by simply adding the caustic a few drops at a time and removing the copper deposit as described above after each application so as to follow closely its progress. In the same manner scratches or tool marks should be investigated. A cross-section of a crack that led to the failure of a detachable-blade propeller is shown in Fig. 3. This crack could have easily escaped detection due to its position at the bottom of the fillet between the machined section of the hub and the blade. Scratches, tool marks, or other abrasions of any ap-

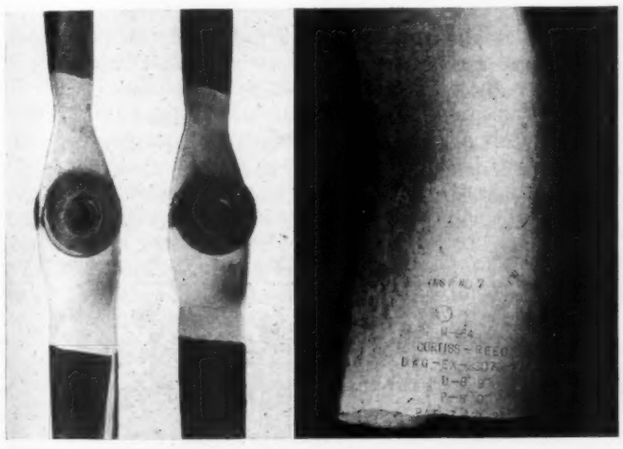

Fig. 7 (left)—Photograph of Curtiss-Reed "D" type propellers showing typical cracks formed during service of the propellers. Fig. 8—Photograph of Curtiss-Reed "R" type propeller. Failure due to notch effect of lettering.

preciable depth should be carefully worked out with an abrasive wherever they are found in any section of the propeller.

Aluminum alloy forgings used in the manufacture of propellers are manufactured to a general specification covering all aluminum alloy forgings. This specification requires that the forgings be free from blisters, fins, seams, laps, cracks, segregations, and other defects that affect their value. Defects that escape detection in the forging blank may be revealed by the etching of the finished or semi-finished propeller, and in addition the etched propellers may show discolorations caused by oil or oxide being forced into the metal by the hammer and marks of considerable depth resembling laps but not accompanied by actual discontinuity of the metal. When a section of a wrought or forged aluminum propeller shows cracks formed during the forging operation or formed as the result of repeated stresses to which the blades are subjected in service, there is little doubt as to the effect on the strength of the propeller. The same is true of serious and excessive amounts of non-metallic inclusions, segregations, seams, pipes, and blowholes. It must be borne in mind, however, that all forged aluminum alloys contain these latter defects to a slight degree. In interpreting the results revealed by

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etching, experience and judgment gained by practical experience on various types of structures are necessary to distinguish between defects that are of a nature that will lead to failure of the material and those which are more or less characteristic of all aluminum alloys.

The examination of a large number of propellers that have failed both in service and when on test has shown that the failure has always been the result of a crack gradually spreading. There have been few instances of failures that can be definitely attributed to faulty material, and the method of inspection outlined herein will enable relatively inexperienced personnel to detect cracks before they spread to proportions that will cause failure under ordinary operating conditions.

The photograph shown in Fig. 4 is an example of a lap formed during forging. In this particular instance the defect is not serious, but in one instance on record the lap extended clear across the blade and was the cause of the propeller failing on the test stand. Seams are usually found on the convex surface of the blade or in the hub section and usually extend parallel to the longitudinal axis of the propeller. They are simply laminations uncovered during the machining operation and are more or less characteristic of all aluminum alloy forging alloys. Where the seams are numerous and of considerable length the material may be considered inferior. A seam may be easily distinguished from a crack by the nature of the edges which are even and often covered with a film of oxide.

Cracks are of two classes: those formed during the forging operation, an example of which is shown in Fig. 5, and those formed during the service of the propeller, which are shown in Fig. 3, 6, and 7. It is this latter type of crack that in all cases has led directly to failure. They are pronounced enough to be easily detected and cannot be mistaken for seams or other types of defects. The former type was found in one lot of propellers that were manufactured on an improperly designed die, but were detected before these propellers had received any appreciable service. Cracks have also started in notches, such as produced by stencilling, and at the base of sharp fillets. Examples of these are shown in Fig. 8 and 3, respectively.

In examining reports of propellers that failed on the test stand, it is interesting to note that in practically all instances the type of crack shown in Fig. 6 is nearly always associated with flutter or excessive vibration.

A light etch, if properly made, has very little effect on the balance of the detachable-blade propeller as determined against a standard blade. If the timing is properly standardized and the temperature and concentrtion are controlled, no change of balance occurs in propellers that are etched periodically in service.

The removal of the amorphous or burnished film of metal from the leading edges causes them to be less resistant to erosion by sand or rain. This can be overcome by buffing a narrow strip along this edge of the propeller or by covering with enamel. Where night flying is practiced it is desirable to paint the thrust surface of the blade with maroon enamel from the 40 in. radius to the tip. For ordinary flying there has been no serious objection to glare on the part of Air Corps pilots.

It is advisable to protect the surface of the propeller when in either storage or service by covering with a light oil; and frequent polishing of the propeller, in connection with the maintenance of the airplane, with a good commercial metal polish such as used for silver or brass, is good practice, since it furnishes an additional means of inspection for cracks. The propeller should be removed and subjected to a light etch and thorough inspection after each increment of 100 to 200 hr. of flying.

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THE Ryan Brougham, the ship made famous by Lindbergh and made popular by its own merits, has now proved its quality as a Seaplane. And what a Seaplane! With its exceptionally quick take-off and with the usual snappy performance of the Brougham hardly affected by the weight of floats, it becomes a natural leader in the class of Wright engined Cabin Seaplanes.

With its wonderful performance the Ryan Brougham Seaplane combines thorough practicability essential for commercial work. Two side doors of the fuselage, in conjunction with flat and wide decks of Edo floats, provide very comfortable means for passengers getting in or out. Shallow draft at the stern and at the bow allows the ship to be brought close to a beach, again making embarking and disembarking more comfortable.

Edo straight sided floats make taxiing very easy, and this is an important feature in Seaplane operation. Good seaworthiness is assured by large displacement of the floats, giving reserve buoyancy of 120%. High location of the wing allows the Seaplane to be brought sideways to any moderately high dock, pier or barge like a motor boat. Built of "Alclad" and Anodically treated the floats resist corrosion and cannot rot or soak water, thus allowing the Seaplane to be moored in open and eliminating all the trouble of frequent launching which would hinder operation.

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STANDARDIZED ALL METAL SEAPLANE FLOATS

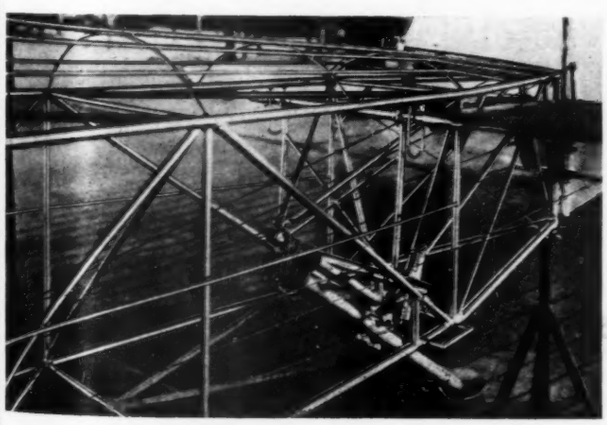
The Stearman Biplane

Continued from page 1454

of the upper wings carries an aileron operated by torque tubes from the center section, then by push-pull tubes to the control gear in the cockpit. By suitable mast relations, a differential action has been secured, thus materially reducing the yaw due to roll. A single tank of 38 gal. capacity, with a gasoline gauge, occupies the center section.

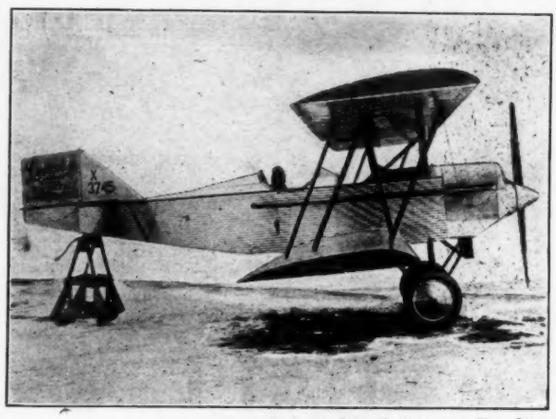
Fuselage of Pratt Type of Truss

The fuselage is of the Pratt type of truss with some modifications. It is produced from chrome molybdenum and medium carbon steel tubing. It will be recalled that elsewhere in this article the statement was made that the structure aft the fire wall is the same regardless of the power plant. To secure this arrangement a detachable engine section has been provided and hence all mounts are welded on separate jigs which carry an exact duplication of the fittings used at the forward station. All fuselage and chassis fittings are jig welded and later introduced into the main assembly, which is in turn completely jig welded with an allowable tolerance at the tail post of 1/16 in. Within the bay normally occupied by the passengers the upper longeron, on the left side, has been replaced by cross tubes, thus facilitating entrance and exit to that compartment. The controls which are permanent in the rear cockpit are duplicated in the forward cockpit but completely removable. To enable the pilot to be comfortable under varying conditions and to have the proper vision, a parachute type seat has been made adjustable through a range of 4½ in. The usual instrument equipment is provided and in addition a Pioneer air speed indicator and compass are included. Fuel valves and the gasoline strainer are located in the pilot's cockpit. Much discussion has been centered around the question of proper location of the throttle and to appease both parties this manufacturer has provided as permanent equipment a throttle quadrant on each side of the pilot's cockpit.



The tail surface and tail skid assembly of the Stearman biplane.

Steel tubing is manipulated in various ways and welded to form the empennage. The stabilizer, constructed of two parts, is made adjustable at the leading edge by means of a linkage actuated from a quadrant in the rear cockpit. By providing an adjustment for the fin the effect of torque and rotating slip stream can be controlled and with the balanced rudder satisfactory directional control and stability with free controls is secured. The control coefficients are such that the criteria for static and dynamic longitudinal stability appear as desirable characteristics.



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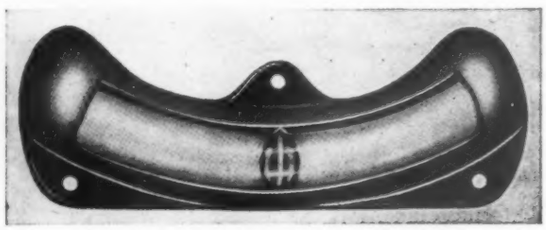

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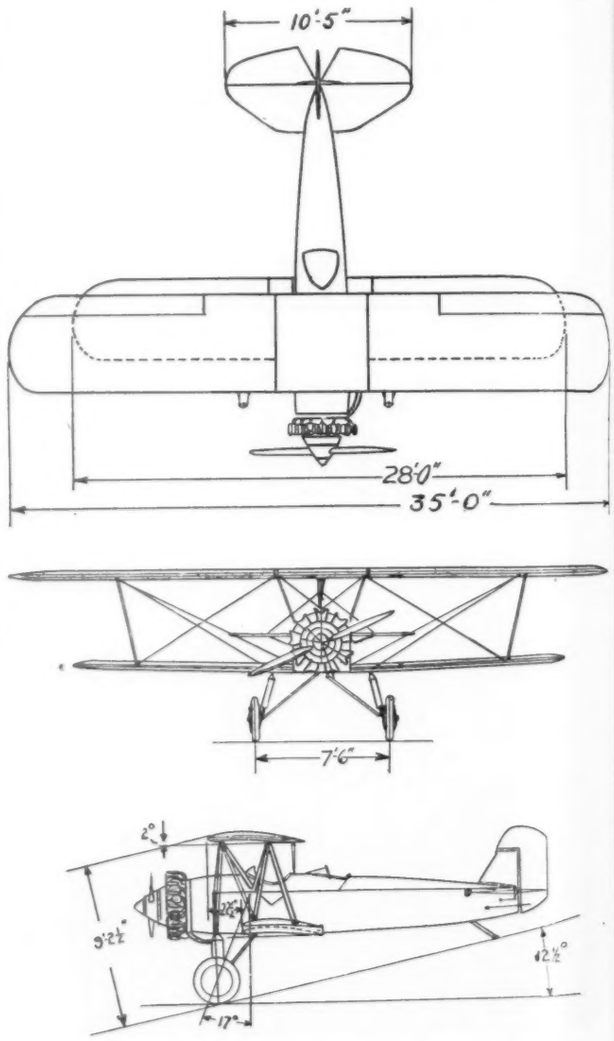
AEROL shock absorbing STRUT

A feature of interest in this design is the landing gear with a tread of 7½ ft. Through the use of a rubber-hydraulic shock absorbing strut, developed by Stearman, a total vertical travel of the gear of eight inches is provided. The landing is made on the hydraulic and the taxiing on rubber chords in tension. Brakes are made integral with the wheels and are operated by pedals in the pilot's cockpit. Hayes type wheels, to which the brakes are attached, carry tires of 30 x 5 in. The entire tail skid assembly is detachable, thus permitting wrapping of the chord on the bench. With the adoption of brakes the tail skid shoe has changed its appearance and this manufacturer is using a spoon type shoe



Three view drawing of the Stearman biplane.

plated with "Stellite". Pressure lubrication is used extensively in the chassis bearings.

Following are the general characteristics and performance data of the Stearman airplane powered with the Wright "Whirlwind" and the Siemens-Halske 125 hp. engines as supplied by the manufacturer:

	Model C-2B	Model C-2K
Span—upper wing	35 ft. 0 in.	35 ft. 0 in.
Span—lower wing	28 ft. 0 in.	28 ft. 0 in.
Chord—upper wing	5 ft. 6 in.	5 ft. 6 in.
Chord—lower wing	4 ft. 6 in.	4 ft. 6 in.
Total wing area	297 sq. ft.	297 sq. ft.
Overall length	23 ft. 6 in.	24 ft. 3 in.

Maximum height	9 ft. 0 in.	9 ft. 0 in.
Wheel tread	7 ft. 6 in.	7 ft. 6 in.
Width of fuselage	34 in.	34 in.
Available cargo space	28 cu. ft.	28 cu. ft.
Passenger accommodations	2 plus baggage	2 plus baggage
Normal pay load	400-500 lb.	350-450 lb.
Gasoline capacity	68 gal.	50 gal.
Power plant	Whirlwind 200 hp.	Ryan-Siemens 125 hp.
Gross weight	2,450 lb.	2,150 lb.
Power loading	12.2 lb. per hp.	17.2 lb. per hp.
Wing loading	8.25 lb. per sq. ft.	7.25 lb. per sq. ft.
Full Load Performance		
Maximum speed	130 m.p.h.	110 m.p.h.
Landing speed	41 m.p.h.	38 m.p.h.
Rate of climb at ground	1000 f.p.m.	625 f.p.m.
Service ceiling	18,000 ft.	12,000 ft.
Cruising speed	110 m.p.h. (1600 r.p.m.)	85 m.p.h. (1550 r.p.m.)
Range in miles	620 mi.	500 mi.

The Hallett Aircraft Engine

Continued from page 1452

The tie rods are streamlined to improve the cooling. The crankcase is a single casting of special aluminum alloy.

Two overhead valves are used per cylinder. The rocker arm bracket is a special development consisting of an aluminum alloy casting split for air cooling of the valve springs and finned for heat radiation. These brackets are bolted to the head in the usual manner. Timken roller bearings are used for the rocker arms and the tappets have a roller for contact with the valve stem. This use of roller bearings eliminates side thrust on both the rocker arm and valve stem and is said to reduce valve action trouble.

No expense has been spared to obtain the best drop forgings available for the master articulating rods, crankshaft, and rocker arms. The piston pins and pins on the lower ends of the articulating rods are interchangeable. The pistons are magnalite of exceptionally substantial design. The main bearings are Timken rollers with a heavy duty SRB ball bearing installed to take propeller load. The master rod bearing is steel back, babbitt lined, and the articulating rods are mounted on bronze bearings. This use throughout the engine of roller and ball bearings is said to have reduced frictional losses to an absolute minimum. Although the crankshaft is said to be heavier than in some engines of much greater horsepower, this additional weight contributes much toward the smooth operation and long life of the engine. The crank pin is 1⅜ in. in diameter and 4¼ in. long, while the piston pins are 1⅛ in. in diameter. All cylinders are Parkerized and exposed small parts are heavily nickel plated.

Unique Manifolding System

A unique manifolding system has been developed which provides perfected feeding of fuel to all seven cylinders. It has been said that this feature of the engineering alone costs more in time and money than any other portion of the engine.

A test run recently witnessed consisted of 45 hr. at 1500 r.p.m. swinging a propeller of 7 ft. 6 in. diameter and 5 ft. 3 in. pitch. The test was run in five periods, four of which were of ten hours duration and one of five. Ordinary commercial gasoline and lubricating oil were used and no cotter keys or lock washers were employed on any part of the engine. This run was completed with the utmost satisfaction from every standpoint of engine performance and no appreciable wear could be detected on any part of the engine

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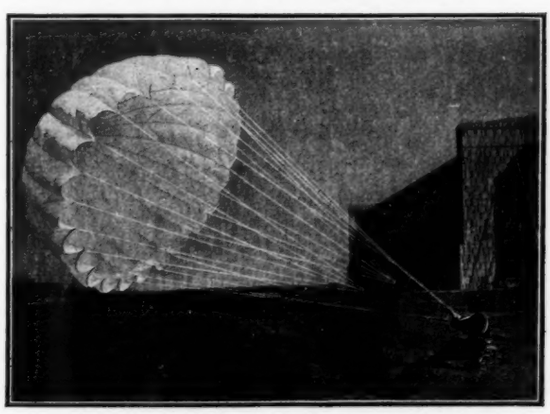

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at the conclusion of the run. No mechanical adjustments or replacements were necessary.

Production of these engines is now under way in the Hallett factory which is so completely equipped that every part except accessories and drop forgings are produced within the plant. The foundry is equipped to cast iron, aluminum, or bronze. The machine shop contains automatic gear cutters, piston makers, boring machines and multiple drill presses and other equipment. A complete assembly department has also been organized and includes a test stand and dynamometer.

Company Has Built Marine Engines

The Hallett Manufacturing Co. has built marine engines involving a production of 400 units per year on the basis of machine production such as will be used in producing the airplane engine. There are already 14 agents in the U. S five in Alaska, two in Canada, and others in Hawaii. Tahiti, Brazil, Cuba, England, Holland, Sweden, Norway, India, Siam, the Philippines, Australia, New Zealand, Italy and South Africa who are distributing Hallett Marine engines and will be prepared to handle supplies and service on Hallett Aviation engines.

Alfred Hallett, designer and manufacturer of the Hallett engine, built his first airplane engine in 1908. Now that he has returned to this field, he is determined to build the best commercial engine on the market to sell at commercial prices.

The specifications on the Hallett engine, as supplied by the manufacturer, are as follows:

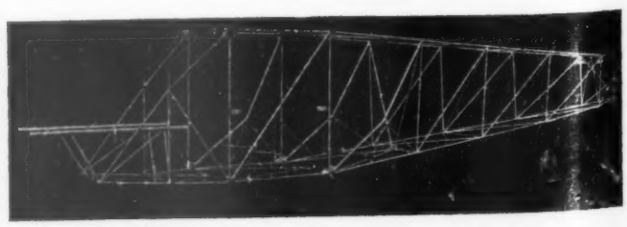
Designation	H-526
Number of cylinders	7
Disposition of cylinders	static radial
Cooling	air
Power, rated	130 hp.
Speed	1800 r.p.m.
Weight, dry without hub or starter	425 lb.
Weight per rated hp.	3.26 lb./hp.
Bore	4⅜ in.
Stroke	5 in.
Displacement	526 cu. in.
Compression ratio	5.2
Diameter of mounting ring	18½ in.
Overall diameter	46 in.
Length overall	37 in.

The Curtiss "Robin"

Continued from page 1451

ing and wooden drag struts. The lift truss is arranged to prevent the warping of the wings from the aileron loads, which is the cause of the poor lateral control noticed in many types of monoplanes.

All of the control surfaces, including the fixed surfaces



The skeleton fuselage of the new Curtiss "Robin" (OX-5).

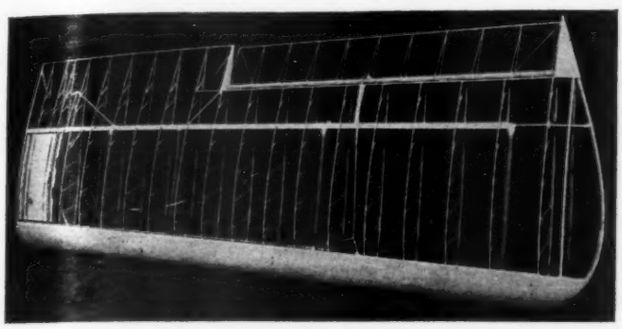
are made of small steel tubes welded to torque tubes of steel, which were thoroughly load tested.

The fuselage is entirely of welded, chrome-molybdenum high

tensile steel, the Warren truss arrangement being used, eliminating the use of brace wires.

The ribs for the airfoil section on the lift struts are made in the same way as are the main wing ribs, pressed from a single sheet of Alclad.

Seats for the passengers are side-by-side and can be adjusted in a fore-and-aft direction readily. This allows a staggered seating arrangement, giving additional shoulder clearance and comfort. For instructing students a dual control can be fitted in the center, not part of the standard equipment, and when that is used the two seats are lined up and the man at the aft control sits in the center of the fuselage.



An uncovered wing of the Curtiss "Robin". Note the aileron control system.

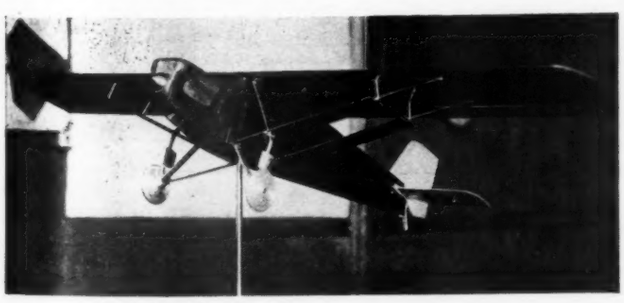
A 25 gal. welded aluminum gas tank is set in each wing root and the engine may be fed by gravity from either tank.

The pilot has the usual stick and pedal control, and has a quick acting stabilizer adjustment at his left side. On the instrument board are mounted a tachometer, thermometer, oil gauge, altimeter and air speed indicator.

The interior is completely upholstered and pleasingly finished.

The wind tunnel tests on the Robin showed ample control in all attitudes of the plane, and a natural stability which was completely checked by the full flight reports. The large dihedral of the lift strut wings and the small dihedral of the main wings added considerably to the natural pendulum stability of a high wing monoplane.

In spite of the fact that the cabin section of the fuselage is made square in section, both for the comfort and the visibility of the fliers, and for simplicity of construction, the plane showed the very surprising maximum lift drag ratio of ten.



The wind tunnel model of the new Curtiss "Robin" cabin monoplane.

According to Major Robertson the price of the plane will be about $4,000 complete. This will be for a plane ready to fly and complete in all details. Provision has been made in the structure for "extras" that the prospective owner might wish, such as dual control, wheel brakes, lights or additional instruments.

The Robin promises to be a very welcome and popular airplane for both the private owner and commercial operator.

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hereby invites and will receive until 12 o'clock noon, Thursday, August 9th, 1928:

(One) Competitive designs for a rigid airship of approximately 6,000,000 cubic feet volume. Designs to be submitted in accordance with section 10, A to H inclusive, of the Aircraft Procurement Act approved July 2, 1926 (44 stat., part 2, page 780). Price for designs and bid for constructor of one and of two rigid airships to be submitted in accordance therewith as provided in subsequences A, B, and E, of Section 10 of said Act;

(Two) Bids for one and for two experimental rigid airships of approximately 6,000,000 cubic feet volume, parts and accessories; and

(Three) Proposals for construction of one and of two rigid airships in accordance with Navy Department's specifications.

Circulars giving full detailed information may be had on application to the Navy Department, Bureau of Aeronautics. Curtis D. Wilbur, Secretary of the Navy, April 18, 1928.

SIDE SLIPS

By ROBERT R. OSBORN

The Mixed Metaphor Prize for this week has been awarded unanimously by the committee to a New York evening newspaper for its description of the landing of General Nobile's dirigible "Italia" at Vadsoe, Norway. The item told of the arrival of the ship over the town on its flight from Stolp, Germany, and after circling several times, heading for the mooring mast on the outskirts of the city,—"Shortly after nine o'clock part of the gas in the bag was discharged and the mooring to the mast completed without a hitch."

* * * *

At the time this is being written Curtiss Aeroplane and Motor Co. common stock has reached 125 and Wright Aeronautical reached 164¼, both new highs from about 23, a year ago. It certainly would be tough if the stockholders managed to work the quotations up to about 200 each, and then find that, as Carl Schory hadn't officially sealed the barographs, the records wouldn't be allowed to stand.

* * * *

The latest publicity concerning the gigantic new British dirigible mentions all of the appointments and refinements of the ship,—"a dining salon to seat 100, with a specially designed dance floor; electric apparatus for cooking, heating, and lighting, cabins and decks like those of a liner," and so on. Nothing was said however about the "kitchen capable of serving a seven-course dinner" which was claimed in the original designs. We thought the British were a bit too enthusiastic in their claims when this announcement was first made, and we'll bet that the reason for the silence now is that the final full flight tests on the kitchen proved it capable of only a four or five course dinner.

* * * *

We have some suspicions about that "electric apparatus for cooking, heating, and lighting", too. Our wager is that it will turn out to be an electric stove—the first one delivered by air in the history of the world.

* * * *

Mr. H. F. P. points out the following item in Airport News in AVIATION, with the comment that he'd certainly like to be flight instructor in some co-educational college,—

"As an instructor for the Kansas City Flying School Mr. Grismer has had the honor of finishing up and soloing several lady students, and always solos them with a kiss."

Not having any pictures of Mr. Grismer available we can't form any conclusions as to whether the kiss is offered as a reward for a successful solo, or whether it is demanded as part payment for the course. However, as every pilot who reads of this scheme is likely to adopt it for his own instruction, we hasten to point out many complications which are likely to arise. In the first place there is always the danger of soloing the really pretty students too soon. And we could mention a couple of instructors whose students would probably stay up until the gas gave out. Then, we can imagine the pilot's wife (one is likely to overlook the fact that most of the instructors are married men) saying as he comes in from a hectic day at the field, "Now what deviltry have you been up to? From that satisfied smile on your face, I'll just bet you soloed that pretty Miss Brown today. I think you'd better give up this flying and go back to your job on the ferry-boat."

New Production

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5 to 55 H.P.	$45	$57
60 H.P. Air Cat	65	77
70-80 H.P. Anzani	76	88
90 H.P. OX-5 Curtiss	76	88
100 H.P. OXX Curtiss	76	88
100-110 H.P. Anzani	94	110
150 H.P. Curtiss—C6 or K6	94	110
150 H.P. Salmson	110	126
150 H.P. Hispano-Suiza	110	
180 H.P. Hispano-Suiza	110	
200 H.P. Wright E. 4	110	
200 H.P. Wright Whirlwind	110	
220 H.P. Hisso geared	115	
220 H.P. Hisso geared	100	
(Without Tip)		
200 H.P. Curtiss V-2	115	
200 H.P. S.P.A. or Mercedes	110	
300 H.P. Wright	110	
300 H.P. Wright 4 bladed	158	
400 H.P. Liberty	126	
400 H.P. Liberty 4 bladed	200	

HARTZELL	
OX5 or OXX6 Motor	$65
OX5 Motor, with Spinner	75
OXX6 Motor, with Spinner	75
Hispano-Suiza, 150 H.P.	100
Hispano-Suiza, 180 H.P.	100
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Curtiss K-6	100
Wright Whirlwind	110
Wright Whirlwind, with Spinner	126
* Brass Tipped † Price Brass Tipped With Standard Spinner	146

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FOREIGN NEWS

By Special Arrangement with the Transportation Division Bureau of Foreign and Domestic Commerce

To Search for Mineral Wealth by Plane

The chief object of the Northern Aerial Minerals Exploration, Ltd., of Toronto, mentioned in the Foreign News Column of AVIATION in the May 7 issue, is to "grub stake" exploration parties, further information concerning the company discloses.

With a squad of 20 airplanes, the officials of the concern feel that discoveries of mineral, forestry, and water power wealth in the vast unexplored regions of Canada in the next five years will be as great as that in the last 50.

John E. Hammell, who has had over 20 yr. exploration experience and who has found a number of mines, is president and general manager of the company. Captain Oaks, who has just won the McKee Trans-Canada Trophy for greatest service done Canadian aviation in 1927, is assistant general manager. Captain Oaks, furthermore, is a mining engineer.

Couzinet Plane in First Test

Air worthiness of Rene Couzinet's tri-engined monoplane was satisfactorily proved in the first test flight of the plane recently held at Orly, outside Paris. The "Rainbow", as the craft is called, took off with 11,000 lb. load, it is said, which is two-thirds of the full load planned for the coming trans-Atlantic attempt. The plane rose with little trouble, and after circling the field, Couzinet and Maurice Drouhin, his co-pilot, flew away in a short cross-country jaunt, two mechanics accompanying them. It returned to the field a short time later and landed with ease.

The Rainbow, deseribed in the April 30 issue of AVIATION, is powered with three 240 hp. Hispano-Suiza engines. These engines replaced the original 180 hp. power plants when greater horsepower was desired.

Names Delegate to Madrid Air Conference

The Secretary of War has received a translation of a note from the Spanish Ambassador extending the invitation of his Government to that of the United States to be represented by delegates at the meeting of the Comite Juridique International de l'Aviation to open at Madrid, Spain, May 29. While most of the questions involved pertain to commercial activities, it is considered advisable to have an Army representative attend. The Secretary of War has, therefore, requested that Maj. Barton K. Yount, Air Corps, Assistant Military Attache for air attached to the American Embassy in Paris, be named as an official observer at this meeting.

Spain Allows Stops at Balearic Islands

The Spanish Government has given permission to the Compagnie Generale Aeropostale whereby planes of this company en route from Marseilles to Algiers can make the Balearic Islands a point of call and use them as a stop on this trans-Mediterranean line. No regular flight schedules have been in operation between Marseilles and Algiers, although the trip has been made frequently at irregular intervals. The Spanish Government had refused to allow the planes to stop, or even fly over, the fortified Balearic Islands, which are in a direct line about midway between Marseilles and Algiers. As a result, a long and hazardous sea trip of 450 mi. had to be made without a stop. By using the Balearic Islands as a half-way station and establishing greater security for the voyage, the Marseilles-Algiers route becomes a more practical one.

Plane Talk

— Tags like these, attached to every Travel Air Ship, are filled out and returned by the owner on arriving at destination.

FLIGHT RECORD

From Wichita to ST. PAUL, MINN.
Left Wichita Mo. 3 Day 31 Hour 9:40
Arrived KANS. ST. PAUL Mo. MAR. Day 31
Hour 6:10 PM Distance 600 miles.
Flying time—Hours 6 Minutes 35
Average speed - - - -
Amount of gas used - 45 GAL.
Amount of oil used - - 1 GAL.
Interesting and unusual happenings enroute:

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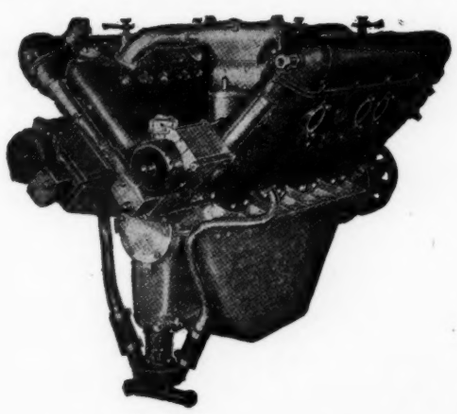

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AIRPORTS AND AIRWAYS

St. Louis, Mo.

By M. L. Alexander

Air express service between St. Louis and cities on most of the contract mail routes was inaugurated on May 1 under the provision of a contract between the Robertson Aircraft Corp., operator of the mail line, and the American Railway Express Co.

For the occasion all of the mail pilots—Bud Gurney, Leslie Smith, and Eyre H. Sloniger—were at this end of the route, so that there were ample facilities for the first shipment. A Whirlwind Travel Air, a Ryan Brougham, and a DH were used for the northward trip. Express service from the Chicago end was started on the next day.

The new service gives express patrons aerial connections with all the points on the transcontinental air routes as well as with Dallas and the cities on the Boston-New York, Los Angeles-Salt Lake City, Cincinnati-Chicago, and Los Angeles-Portland routes. The service is being expanded to include cities on every air route in the country.

Special delivery will be given air express matter. The consignee will be called on the telephone as soon as his shipment has been unloaded and if he is ready for delivery the package will be sent to him by special messenger. The rates range upward from 25 cents the quarter pound, between St. Louis and Chicago, to 65 cents, from St. Louis to Los Angeles.

Anheuser-Busch, Inc., has joined the ranks of the big business institutions that use the airplane. A Ryan Brougham, purchased for $11,500 recently by Anheuser-Busch from the Von Hoffmann Aircraft Co. here, is being painted at Lambert-St. Louis Field along special lines set out by the company—silver wings and red fuselage, with the house emblem on the side—and will be placed in service shortly.

Joseph Hammer, who has been flying out of Lambert Field for several years, will pilot the plane. According to an official of Anheuser-Busch, it is the first of a fleet to be assembled by the organization for the transportation of its officials and sales representatives. One of the first trips of the new plane will be to Canada and an "NC" designation is to be obtained for the plane from the Department of Commerce.

Bill Chaudet, president of the General Brake Service Corp., another business man who uses an airplane in his work, has his OX-5 Travel Air all groomed for a trip to Richmond, Ind., where he will confer with officials of the Richmond Air Brake Co. Fred Gannett, secretary and general manager, and Carl Van Ausdall, sales manager of the Richmond company recently visited the field and inspected Chaudet's plane. Chaudet himself is a pilot and his wife is taking flying instructions.

H. C. Strader of Long Beach, Calif., flying salesman for the makers of the Russell Lobe parachute, recently visited Parks Airport in a Hisso Travel Air. He was accompanied by Jimmy Young, a professional jumper, who demonstrates the Russell parachute to prospective purchasers.

Boston, Mass.

By Daniel Rochford

Boston flying during the first week of May 1928 showed a total of 372 hr. divided as follows: Naval Reserve Air Station at Squantum 87 hr. 20 min; Boston Airport Corp. 64 hr. 50 min.; Army regulars and reserves 43 hr.; Dennison Airport Corp. 36 hr. 17 min.; 101st Observation Squadron, M.N.G., 31 hr. 55 min.; Bay State Flying Service, Inc., 29 hr. 35 min.; Edward T. O'Toole 17 hr.; Old Colony Airways, Inc., 12 hr.; Thomas Croce 11 hr.; Colonial Air Transport approximately 20 hr.; and individuals 7 hr.

An Egyptian, Aly Bey Yehia of Alexandria, is taking flying lessons at the Boston Airport from Bay State Flying Service. This company flew its 29 hr. 35 min. using one plane, an American Eagle. Al Backstrum was its pilot.

Ten men enrolled during the first week for the new evening aeronautics course being conducted by Boston Airport Corp. at its new Hotel Statler offices. Daniel C. Sayre of the M.I.T. aeronautics faculty expects enrollment to reach 30 this month.

The Walter Beach 1926 national reliability tour winning Travel Air biplane has taken a new lease of life. It has been rebuilt and finished and given a new Whirlwind engine and is back at work for the B.A.C. at the airport.

Reserve ensigns training at the Squantum air station are being allowed to stunt their planes, this being permitted for the first year now due to guarantee of sufficient planes for training purposes.

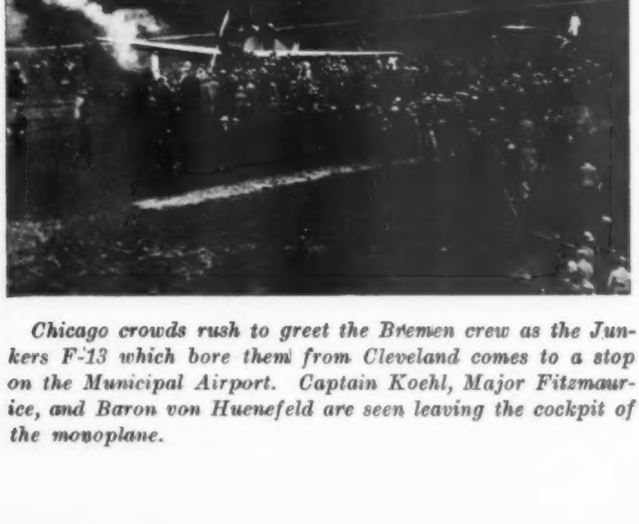
First Inspection Held

The first class of naval reserve students includes two men from Washington, D. C., 10 from Philadelphia, and one from Newport, R. I. They are at Squantum for 45 days. On successfully completing the primary flight work here they will go to Pensacola for advanced training and commission. The first inspection of the reserve Navy squadrons of the First District was recently held at Squantum with nearly 50 pilots present. Lieut. Reginald D. Thomas, U.S.N.R., is station commander.

The Massachusetts National Guard Squadron did the first shooting from Boston airplanes in 1928 when Maj. Charles H. Wooley fitted a machine gun to the rear cockpit of an O-11 and with Capt. Clarence Hodge as gunner, flew down Boston Harbor for practice in preparation for the Langley Field contests next month.

Colonial Air Transport, Inc., completed all mail trips the first week in May except one, being turned back by bad weath-

"Welcome to Chicago!"



Chicago crowds rush to greet the Bremen crew as the Junkers F-13 which bore them from Cleveland comes to a stop on the Municipal Airport. Captain Koehl, Major Fitzmaurice, and Baron von Huenefeld are seen leaving the cockpit of the monoplane.

er the night of May 5 at Manchaug, Mass. Incoming mail to Boston for the week totalled 219 lb. 8 oz., outgoing 407 lb. 4 oz.

Edward T. O'Toole, the writer, and Mrs. Daniel Rochford, flew with Albert L. Edson piloting in the new Dennison Airport Fairchild cabin monoplane to Martha's Vineyard Sunday, May 6, to inspect the new Martha's Vineyard Airport to be operated this summer by O'Toole and Deputy Sheriff Tom Wilson of Boston and Edgartown. En route Colonel Green's Airport at South Dartmouth was viewed. It is nearly finished with only an acre or so of fill left and the rolling and seeding. It will be one of the largest airports in the East. The Colonel expects to carry on scientific aeronautical work specializing in radio communication and control of aircraft.

WBET, Boston radio station, is broadcasting aviation talks again every Monday, giving the time free. Speakers so far have included: R. W. Mackie of Colonial, Lieut. Frank C. Crowley, reserve pilot on duty with the First Pursuit Group, L. Ponton de Arce of Old Colony Airways, and Edward T. O'Toole. Every flying group is to be given an evening as was done last year.

Springfield, Mass.

By Charles Hanson Gale

A twin-pusher model airplane manufactured by Matthew Moziek flew more than six minutes in a contest arranged by the local newspapers recently and established what the directors declared to be a record. At any rate, the little machine kept on flying until it was lost from sight in some bushes and timing automatically halted. The model building and racing is proving very popular here this spring and the series of demonstrations held at the various flying fields have attracted large numbers of entrants and observers.

Joseph E. Kerigan, treasurer of Massachusetts Airways of this city, has invited his fellow delegates to the Democratic National Convention at Houston, Tex., in June to make the trip in a Ryan cabin plane which the company handles here. The concern represents also the Eaglerock plane. It is reported that William J. Granfield, Robert W. King, and John D. O'Connor, the other delegates, have accepted the invitation.

Direct air mail connection for Springfield will be realized soon, it has been announced, with the signing of an agreement between the Springfield Airport Corp. and the American Airports Corp. of New York City. The latter concern will undertake the development of the Fisk Park Airport site and at the same time assurance was given that it would be used as a stopping place for the proposed extension of the Cleveland-Schenectady line east to Boston.

From Dance Hall to Hangar

The Springfield Airport Corp. has done some work on the airport and it has been used by light commercial planes. The old dance hall was remodeled into a large hangar and the other buildings which were part of the park's equipment as a race track and amusement center are said to be easily adaptable for flying purposes.

The American Airports Corp. under the agreement will complete the work of grading the field and will install lights for night flying. The tract is 2.9 mi. from the post office. Runways have been laid out to give lengths of 3100, 2500, and 2200 ft. in various directions.

The company announced at the same time that it contemplated operating a flying service between this city and Pittsfield, 53 mi. from here. A tract has been leased in that city to serve as a terminal and plans include also passenger, student instruction, and airplane sales for the Pittsfield area.

New York interests will combine with local interests in the manufacture here of a new plane soon, it was announced by the Springfield Airport officials. A factory has been secured

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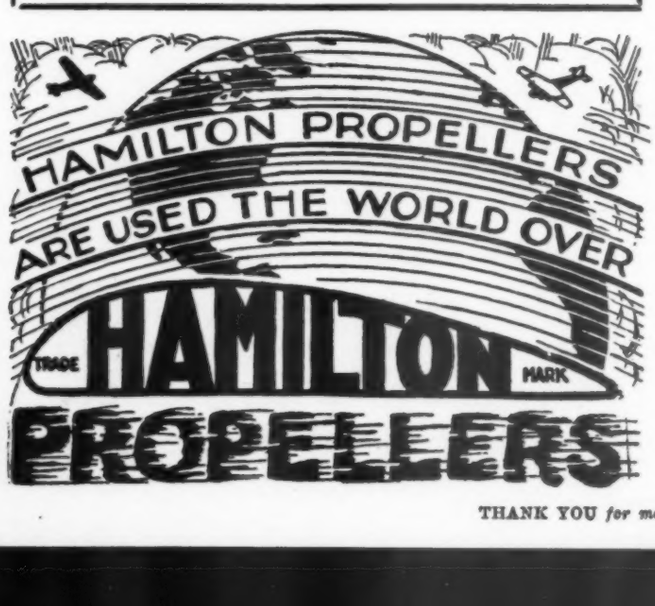

and arrangements are said to be well advanced. This will bring a new industry to this city. The nature of the backing of the enterprise is taken to assure early start.

Cincinnati, O.

By Harold Norman Loeb

Harold Speer, sales manager of the International Aircraft Corp. at Anchor, suburb of Cincinnati, is rejoicing over favorable attention being given his company's planes in the Southwest, following the winning of the "On-to-Dallas" race by the corporation's "Sporter," a three passenger biplane powered with an OX-5 Curtiss engine.

The plane was driven to Dallas by Captain Eaton and Harold Humphreys, International company distributors for Texas and Oklahoma, and won the contest sponsored by the Dallas Aviation Club in conjunction with the opening of the half-million-dollar Dallas municipal airport.

Planes from every part of the country were flown to Dallas in the race, the distance flown, the load carried and their power being the points on which they were judged.

Speaking "to Cincinnati and through Cincinnati, everywhere," Charles Planck, sales manager of the Embry-Riddle Co., Cincinnati air mail carrying concessionaires, urged members of the local real estate board recently to keep prices for proposed airport sites at the lowest possible figure instead of boosting them as soon as a possible purchaser was found.

Planck also recommended that space for landing fields should be considered in connection with any proposed new subdivisions within a radius of 60 mi. of the city, asserting his belief that in the near future commuters would resort to airplanes to carry them between their homes and their offices.

Planck mentioned the case of Paul Strasburg, Detroit, who has been given some publicity for flying 150 mi. to work every morning, but the speaker said he felt that Strasburg does this for convenience rather than for notoriety.

Philadelphia, Penna.

Amberse M. Banks of this city made four trips and covered more than 850 mi. in a Pitcairn Mailwing (Wright Whirlwind) recently when Pitcairn Aviation, Inc., inaugurated the New York to Atlanta air mail service.

Banks started at the northern terminus of the route at Hadley Field, New Brunswick, N. J., taking off with two pouches filled with mail, at 8:32 P.M. He flew the mail to Philadelphia and was the center of the opening night ceremonies staged at the Philadelphia Airport, in which Col. George E. Kemp, postmaster of Philadelphia, officials of the Aero Club of Pennsylvania, and officials of the Ludington Philadelphia Flying Service, the airport lessee and operator, participated with 2,000 visitors.

Banks arrived here at 9 P.M. and took off eight minutes later, going through to Richmond, Va., the main depot of the line, after an air mail stop at Washington. Meanwhile, Verne E. Treat, flying the second Pitcairn Mailwing out of New Brunswick, nosed into a soft portion of the Philadelphia Airport upon his arrival here, his plane overturning in the presence of 500 spectators. Treat was uninjured. Covered with mud, he was extricated by Ludington employees. The rear end of the fuselage was a complete washout and the plane will have to be rebuilt.

Banks was at Richmond when news of the accident reached the main depot of the new line. He hopped into another Mailwing and made a non-stop flight to the Philadelphia Airport to pick up Treat's mail. Arriving here at 2:45 A.M. he refueled, took on Treat's mail, and flew it to Washington. Later, he flew back to Hadley Field, via the Philadelphia Airport, accompanied by Edward J. Morrissey, one of the Pitcairn reserve pilots.

Charles Townsend Ludington, president of the Ludington Philadelphia Flying Service; Virgil Kauffman, secretary of

the Aero Service Corp. of Philadelphia and Norristown, Penna.; Maj. J. Sydney Owens, commander of the 28th Division Air Service, P.N.G.; W. S. Green, aircraft inspector in charge of the Philadelphia headquarters of the Aeronautics Branch; and Harold A. Holbrook, director of public information for Pitcairn Aviation, Inc., spoke during the "Aviation Day" program of the City Club of Philadelphia.

Every phase of commercial and military aviation within the city was discussed by the speakers, all of whom are practical pilots. The meeting was suggested and arranged by Ray Krimm.

A Symposium on aviation featured one of the sessions of a three-day meeting here of the American Philosophical Society. The speakers included C. H. Biddlecombe of New York, consulting aeronautical engineer and former major in the Royal Air Force, who said planes must travel 150 to 175 m.p.h. if aviation is to be made a commercial success; Lieut. Comdr. Charles E. Rosendahl of the naval dirigible Los Angeles, who said trans-Atlantic flying will be "common and safe within a few years," and Edward P. Warner, Assistant Secretary of the Navy for Aeronautics, who told of the Navy's airplane carriers and its work with wind tunnels.

Mr. Warner left his desk in Washington at 12:30 P.M., flew to Philadelphia, delivered his address, and flew back to the capital to meet a 5 o'clock engagement with half an hour to spare.

Milwaukee, Wis.

By H. C. Brunner

Lieut. Lester J. Maitland, native of Milwaukee, and Lieut. Albert F. Hegenberger were recently initiated into the Milwaukee Voiture 40 and 8. Lieutenant Maitland, who is aid to Trubee Davison, assistant secretary of war in charge of aviation, came to his home town by rail for the first time since 1921. He stayed over the week-end, then left for Washington, while Lieutenant Hegenberger returned to Dayton, O., to resume duties in the engineering department of the Air Corps.

The Milwaukee Park Commission has requested the county highway committee that $205,600 be spent immediately for additional land, $40,000 for the construction of a new hangar, and $40,000 for drainage, construction of runways and preparation of land. The airport development plans submitted by Jerome C. Dretzka includes recommendations for the purchase of 13 parcels of land comprising 269 acres. This will enlarge the field to 465 acres.

Mr. Dretzka suggested that four of the parcels, amounting to 106 acres, be used for extension of the present runways, construction of new runways and the erection of hangars. Members of the committee indicated that if this sum is necessary for improvements at the airport an attempt will be made to provide it.

Inspect Airports

While members of the county park commission and the county park board were inspecting the county airport to determine what improvements were necessary, the Association of Commerce air service committee took similar steps to study the development work needed at the Maitland and County fields.

A committee of business men have been appointed to investigate the cost and practicability of an aeronautical show for Milwaukee in 1929. Those who have been named on the committee include Clarence R. Falk, Elling O. Weeks, Stewart F. Auer, Thomas F. Hamilton, Rudolph Hokanson and Jerome Dretzka.

The air service committee of the Association of Commerce has set May 21 as the tentative date for the second Wisconsin air mail conference to be held in Milwaukee. George O.

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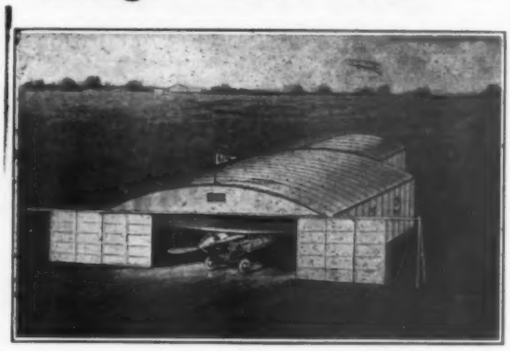

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DETROIT

Hoehn, committee secretary, will send letters to the associations of commerce of cities on the two proposed air mail routes, inviting them to be represented at the conference.

Carl Herzfeld, chairman of the air service committee of the Milwaukee Association of Commerce presented the awards to the winners in the model plane building contest at a recent banquet. Five silver cups were presented to the county champions, 45 gold-winged pins to division winners, and 18 certificates of participation to those whose planes flew successfully in the meet.

Speakers, at the gathering of approximately 300, included L. H. Kottnauer, general field assistant of public schools; Walter Moss, one of Milwaukee's pioneer model plane builders; Thomas Hamilton of the Hamilton Metalplane Co.; Hans Feldmann, Paul B. Clemens, assistant superintendent of schools.

Duluth, Minn.

By H. A. Lindbergh

As there seems to be no effort on the part of those in authority to provide Duluth with a municipal airport, several individuals are planning on developing their own fields to carry on their activities.

G. Bocklund and A. Stark have purchased a late model OX-5 Waco from the Northern Airways, Inc., of Wausau, Wis., for delivery in June or July. There is a level site on the Seville Road that will undoubtedly be used by Stark and Bocklund as their field. Passenger hopping will be the main source of their income for the present at least and when the Fair season in the surrounding communities is in full swing again, then several plans under consideration will be put into effect.

An American Eagle was recently delivered to W. E. Sickner, having been purchased from the Automotive Investment Co. of Minneapolis, Minnesota distributor of this type as well as the Ryan monoplanes. Ken Pettit, former chief pilot of the Arrowhead Airways of Superior, Wis., flew the plane from the Wold-Chamberlain Field and will continue to act as pilot for Sickner, who has the agency for the American Eagle and the Ryan in the northern part of the state. The activities, which include student instruction, passenger carrying, cross-country trips, etc., will be carried on temporarily at the field in Superior pending negotiations for sites in or near Duluth.

Beginning on May 26 and extending until July 1, the American Eagle will partake in an intensive publicity campaign put on by the Automatic Washing Machine Co. of Newton, Ia., to advertise their washers. Most of the important cities and towns in the northern half of Minnesota will be covered in a thorough drive, during which there will be close cooperation with the local dealers. A careful check will be made on the effectiveness of the use of the plane as an important factor in the campaign and if it is as resultful as expected, then this idea will be carried out in other parts of the country.

Garden City, L. I., N. Y.

By M. Brown

Major Fitzmaurice and Capt. Koehl, trans-Atlantic fliers, have both been making visits to Curtiss Field to fly the Junkers plane, sister plane of the Bremen. Captain Koehl seems to prefer to fly at an early hour in the morning, probably to avoid the crowds.

The Klemm monoplane, powered with a two cylinder Mercedes engine, is being flown at Curtiss Field by Frank Kirsch, pilot, who came from Germany with the planes, five of which are in this country. As the plane has a rather slow flying speed and uses only one and a half gallons of gas in an hour, it can be flown for 12 hr., it is said, without refueling. The wings are part wood and part fabric. The extension of the

ailerons, on the end of the wings, is a rather unusual feature. On account of it being a low-wing monoplane, the visibility is exceptionally good.

Clarke Hyatt and two other "Wise Birds" of Detroit visited Curtiss Field recently, in one of their Stinson-Detroiters, piloted by Towns. William A. Donnely and W. Comstock were the other members of the party.

Waco Service at Curtiss Field is building a new hangar which will be ready June 1. It is expected to hold about 14 Wacos.

One of Lieutenant Kitchingham's students, Margaret O'Mara, recently obtained her private license, and H. E. R. Hall, another student, has bought a Stearman powered with a Wright Whirlwind. Hall intends to make week-end flights to Virginia.

Portland, Ore.

By John W. Anderson

The government upper weather observation station asked by Portland fliers for the Port of Portland Airport seems on its way to realization. The airport has been added to a list of fields for which Congress is considering observation station appropriations. James H. Polhemus, general manager of the port, has just been notified of the action by Senator Charles L. McNary of Oregon.

The Rankin Flying Service has perfected its plans for the Portland-Yakima, Wash., passenger and express service to be inaugurated this month. Two Ryan cabin monoplanes capable of carrying four passengers, the pilot, and 1000 lb. of freight will be used. One round trip daily six days a week is called for in the opening schedule.

The *Oregonian*, Portland daily paper, has announced plans for shipping its Yakima supply of papers by Rankin planes. This will give Yakima readers the latest edition of the paper several hours earlier than they have been receiving a less complete edition. If the experiment is a success the *Oregonian* will send papers for all the territory tributary to Yakima.

Passenger fares will be $20 one way and $35 round trip. Over 100 tickets have already been sold. Express rates will be 10 cents a pound with a 25 cent delivery charge for each package.

Because of unfavorable weather conditions J. G. "Tex" Rankin has postponed his projected attempt to break the world's sustained flight record until June 4, the date of the next full moon.

Rankin Lengthens Course

The Rankin School of Flying has increased its standard course of instruction from 10 to 12 hr. One hour each of seaplane and cross-country navigation training is included.

Lieut. A. B. Mackenzie, head of the Mackenzie-Goff Aviation Co., has been elected president of the newly-formed Portland Aircraft Operators' Association. Other officers are Henry Ward, vice president; V. W. Strode, secretary-treasurer; and Carl H. Johnson, J. G. "Tex" Rankin, and Capt. L. G. Devaney, directors. The operators organized in order to facilitate rate agreements with the Port of Portland for use of the airport.

Jack Tauscher, Portland traffic officer, made his solo flight at the Vancouver, Wash., airport, recently finishing a course of flying instruction under Lieutenant Mackenzie supplemented with Army training.

The first of three American Eagle biplanes to be used by the Rinehart Flying Service at the Hayden Island Amusement Beach in the Columbia River this summer has been delivered to Jimmy Rinehart, 19-year-old head of the company, by the Mackenzie-Goff company.

An American Eagle biplane has been delivered to Jesse Digman of the Golden West Coffee Co. by the Mackenzie-

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Goff Aviation Co. The plane will be christened "The Girl of the Golden West" and will be used to advertise the company's product.

Detroit, Mich.

By John T. Nevill

The 107th Observation Squadron, M.N.G., recently held a "birthday dinner," commemorating the second year since the unit's recognition by the Federal Government. The dinner was held just one year following receipt of the squadron's first plane, a Jenny, now discarded.

Honor guests included Maj. Gen. Guy M. Wilson, commanding officer of the 32nd Division, Colonels John S. Bersey and Leroy Pearson, adjutant and chief-of-staff, respectively, of the Michigan National Guard, State Senator Harold E. Stoll, and State Representatives Joseph C. Armstrong and Charles N. Culver. Music was furnished by the 106th Medical Regiment Band. Senator Stoll is an enthusiastic booster for the air unit and plans to join the squadron as an enlisted man. Maj. Floyd E. Evans is commander of the squadron.

Bernt Balchen returned to Ford Airport recently with famous Ford "No. 10", the tri-engined monoplane, used to rescue the Bremen fliers from Greenely Island, and departed the following day with the Bellanca monoplane to be used by Commander Byrd on his proposed flight to the South Pole.

A total of 732 passengers were carried over the Detroit-Cleveland air line during April, Stanley Knauss, general manager of the Stout Air Services, Inc., operator of the line, recently announced. The number is a 65 per cent. increase over the March traffic, Knauss said.

Since the Detroit-Cleveland line opened last November 1, a total of 2,553 persons have been carried. This is three times as many as were transported over the Detroit-Grand Rapids air line, the first venture of the company.

A total of 3,340 persons took the 15 min. sightseeing flight over the city during April against 1,552 in March. Since January 1 6,164 passengers have flown over the city in the company's planes.

Additional equipment, now being obtained, will enable the company to open their Detroit-Chicago line next month, and will augment the sightseeing services operated by the company both here and in Cleveland, according to Knauss.

The Dearborn Exchange Club has arranged with the Stout Air Services, Inc., to open a temporary plane service to Toledo during the national convention of Exchange Clubs in Toledo July 22 to 27. Sightseeing tours over Toledo will be included in the trip.

San Francisco Bay, Calif.

By R. J. Leidy

The Mt. Diablo beacon light recently installed by the Department of Commerce has been seen from Fresno, a distance of 170 mi., it is reported by Pilot E. L. Remelin of the Pacific Air Transport Co. He stated that the beacon was a great help in striking the shortest route to the bay district. The Department of Commerce is now placing beacon lights every 10 mi. along the mail route, starting from Los Angeles. They are 24 in. revolving beacons of 3,500,000 candle power.

One of the latest additions to the Oakland Airport equipment is a service car, painted red and resembling a fire engine. It is equipped with siren, spotlight, fire extinguishers and towing apparatus. The crew consists of the airport personnel, with Supt. Guy Turner in command.

Airplane photographs and architects' drawings of Berkeley's proposed new municipal flying field on the waterfront have been completed and are included in a window display arranged by the Allied Flying Club of Berkeley. The club is sponsoring the movement to establish the municipal field.

A radio telephone set has been installed in the offices of the Pacific Air Transport at the Oakland Airport. Similar

sets are in operation at Portland, Medford, Bakersfield, and Los Angeles. They operate on 46 meters in the day and between 87 and 100 meters at night.

Man's ingenuity has fashioned airplane engines reaching the practical minimum of weight of but one pound per horsepower, according to Dean Baldwin Woods, professor of aerodynamics at the University of California, Berkeley, who points out that future development in aviation must come in other directions than lightening engines.

"The engine and propeller, forming the power plant of an airplane, are just one of the four main divisions of the machine," he declared in a recent address before the Oakland Lions' Club. "The others, all capable of improvement, are the wings, the body, and the controls and auxiliary parts."

American airports are far ahead of most of the airdromes in Europe, according to William G. Roll, Jr., American vice consul in Bremen, Germany, who was a recent visitor in the bay district. Roll inspected both Mills Field, San Francisco, and the Oakland Municipal Airport. Possibilities of commercial aviation on the Pacific Coast are tremendous, he declared.

Burley, Idaho

Having decided on a location for a permanent airport site for Burley, the aviation committee of the local chamber of commerce has taken an option on a triangular tract of ground northeast of the fair grounds. At present this land is being used as an intermediate field for mail planes. Its longest side extends from the new Heyburn Bridge along the highway to a point close to the fair grounds, affording a runway of more than 5,300 ft. Of this, 3,000 ft. has been cleared and leveled. There are 240 acres in the tract, and long take offs can be laid out in both directions.

Orlando, Fla.

By R. T. Bly

Local air enthusiasts are casting pleased glances on the sturdy young shoots of grass springing up on Orlando's future Municipal Airport. Phillips Ave. is being paved to the field.

W. L. Stribling, Jr., Georgia light heavyweight boxer, flying his own Swallow with his mother as passenger, stopped at Buck Field en route to a fight engagement in Miami and looked over the site of the new airport.

"Blue Heron"

Miss Ida Perry Black christens one of the Chesapeake Aircraft Co.'s new Fairchild planes "Blue Heron". The ceremony took place at Logan Field, Baltimore, Md. "....And," says our correspondent, "the champagne was real."

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Berling leather magneto cover $1.00. Rotary map case—rotate as trip progresses—$2.50. Dandy thermometer (oil or water temperature gauge) with tubing $7.50. No. 120 oil gauge $1.50. Set of 16 Burd high compression piston rings for OX5 $2.50 or for OXX6 $4.80. OX5 piston pin 50c, or for OXX6 $1.10. Dandy new Zenith OX5 carburetor $35.00 or slightly used thoroughly checked $27.50. Liberty cylinders $20.00 each.

"A" grade cotton cloth 50c yd. 2¼" scalloped "A" tape 5c yd. or 100 yd. rolls $4.50. Ordinary 2¼" scalloped tape 4c yd. or 130 yd. rolls 3½c. 5 gals. Nitrate dope $8.00, 25 gals. or more $1.40 or 50 gal. barrel $63.00. Metal wing skids for JN4D or Canuck $3.00. Log books:—pilot 50c, engine 50c, airplane 75c or set of three books in one binder $3.00.

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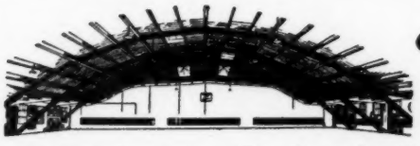

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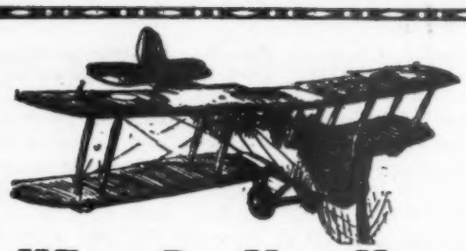

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U.S. Air Forces

Squad on Tour Headed By Major Lanphier

Twenty-four pursuit planes and seven transports carrying 31 officers and 31 men took off from Selfridge Field recently on a month's program of maneuvers that will take them to eight Army flying fields in the East and South. The fliers were headed by Maj. Thomas G. Lanphier, flight commander of the First Pursuit Group, Selfridge Field. The first leg of the tour took the pilots to Bolling Field, Washington, where the group gave a demonstration maneuver before President Coolidge.

With the exception of Sergt. Byron Newcomb, all of the transport pilots were from other Army fields. Pilots of the pursuit planes in addition to Major Lanphier, were Capts. Vincent B. Dixon and Hugh Elmendorf and Lieuts. K. C. Gregg, Irvin Woodring, Victor H. Strahm, Glenn P. Barcus, Frank G. Irvin, Joseph G. Hopkins, Demas T. Craw, William H. Doolittle, Ernest H. Lawson, Thurston H. Baxter, Harry A. Johnson, Frank Klein, Burton M. Hovey, J. J. Williams, William L. Cornelius, Russell M. Keillor, Louis C. Mallory, Keith Roscoe, and Lee Gehlbach.

Capt. Marcial Arredondo, Chilean air service flier, who is here studying American Army air service methods, also accompanied the fliers in a pursuit plane.

From Washington, Major Lanphier will lead the group to Langley Field, Va., where Capt. Frank Pritchard, and Lieuts. J. E. Bodle, J. T. Prindle, and Frank Robinson, Selfridge Field pilots who flew to Edgewood, N. J., recently to obtain smoke screen equipment, will join the tour. The itinerary then follows: Fort Bragg, N. C.; Columbus, Ga.; Monroe, La.; Fort Sill, Okla.; Fort Riley, Kan.; Fort Leavenworth, Kan.; and Chanute Field, Ill. Stops of at least three days will be made at each field.

House Passes Separate Promotion Bill

Representative Furlow's bill providing for a separate promotion list in the Army Air Corps has been passed by the House of Representatives, states a report from Washington. The bill provides that men serving in the Air Corps shall be listed in the same order as on the Army Promotional List. In this way, officers whose names appear on the original Air Corps promotion list will not, as frequently the case heretofore, be considered as having less commissioned service than officers whose names appear below their own on the list.

To Protect France Field from Erosion

Approval has been given by the Secretary of War to a project for the protection of France Field, Canal Zone, from erosion brought on by the action of tides and high waves. An appropriation has been authorized which will be used to build a revetment on the shore line.

Hangar at Chicago Authorized

Authorization has been given by the Secretary of War to the Commanding General, Sixth Corps Area, to award the contract for the construction of a 110 by 210 ft. steel hangar at the Chicago Municipal Airport to the Austin Company, Cleveland, O.

To Light Kelly Field

A project for complete installation of a night lighting system at Kelly Field, Tex., has been approved by Secretary of War Dwight F. Davis. An expenditure approximating $13,970 will be required, it is said.

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First "Aerial Photos," taken by Major H. A. Erickson, 1911.

First "Govt. Aero Squadron in U. S." organized in 1912 by Maj. Foulois at North Island (now Rockwell Field) San Diego.

First "Radio Used in an Airplane," by Curtiss and Morin, in 1912.

First "Loop the Loop," in an airplane by Lincoln Beachey, in 1913.

First "Night Flying," by Major T. C. Macauly, in 1913.

First "Air Mail," San Diego to Coronado, in 1913.

First "Aerial Bombing," by Riley T. Scott, in 1914.

First "Use of Planes to Locate Schools of Fish," in 1914.

First "Transcontinental Squadron Flight," in 1918.

First "Re-fueling In Flight," by Smith and Richter in 1923.

First "Non-stop Transcontinental Flight," by McReady and Kelly, in 1923.

First "Regular Passenger Service," San Diego to Los Angeles, in 1923.

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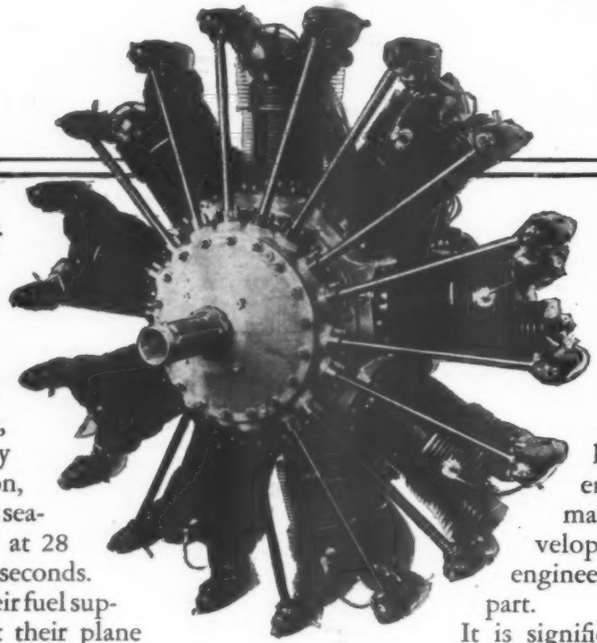

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WHEN, on Thursday, May 3rd, Lieutenants Gavin and Soucek, U.S.N., took off from the Delaware River at Philadelphia, in their PN-12 plane, carrying J. C. Proley, Navy mechanic, and W. F. Dayton, Wright mechanic, the world's seaplane duration record stood at 28 hours, 35 minutes, and 27 seconds.

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